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Sport Fishery Abstracts

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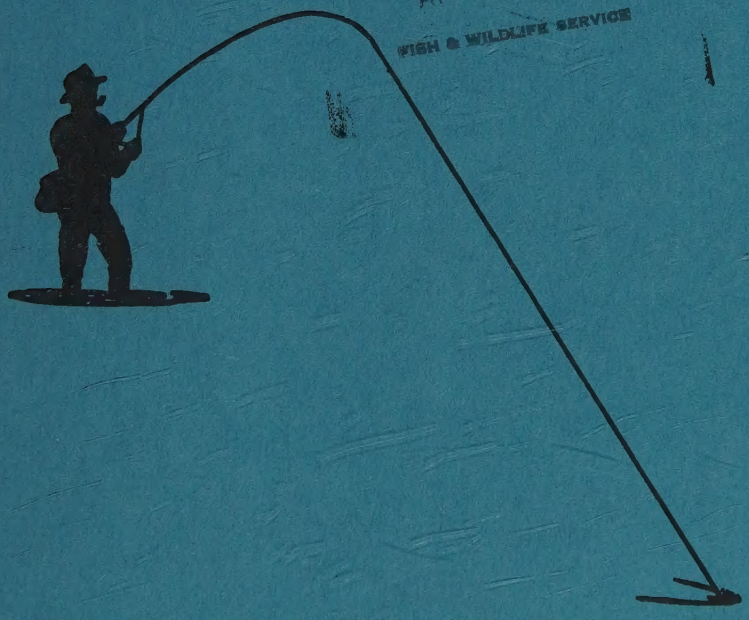

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Sport Fishery Abstracts is intended to furnish fishery biologists in government agencies and educational institutions with abstracts of the current literature in sport fishery research and management. Abstracts of papers on limnology, ecology, natural history and other fields of specialization will be included when the subject has application to the conservation of sport fish and the restoration of sport fishing.

One volume consisting of not more than four numbers will be issued each year. Each number contains separate Author and Subject indexes, with the final number of each volume containing cumulative indexes. The last number of each volume contains a list of publications screened for appropriate material.

Suggestions for improving the usefulness and coverage of Sport Fishery Abstracts are solicited.

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6874. Tebo, L. B., Jr. (U. S. Public Health Service, Cincinnati, Ohio), and Edward G. McCoy. 1964. EFFECT OF SEA-WATER CONCENTRATION ON THE REPRODUCTION AND SURVIVAL OF LARGEMOUTH BASS AND BLUEGILLS. Prog. Fish-Cult. 26(3): 99-106.

Largemouth bass (Micropterus salmoides) and bluegill (Lepomis macrochirus) brood stock were injected with chorionic gonadotrophin to induce ovulation. Eggs and sperm from the injected fish were stripped into containers having various concentrations of sea water and placed in a closed recirculating system to determine the effect of sea-water concentration on hatching and survival. Additional bioassay experiments were conducted on fingerlings of the same species. Sea-water concentrations up to 20% did not prevent the successful fertilization and hatching of largemouth bass eggs. At concentrations of 15% sea water and above, many hatched fry were weak, deformed, and incapable of survival. It appears that the maximum concentration of sea water at which successful development of eggs and fry can take place is between 10% and 15% sea water. The 96-hour TL_m for largemouth bass fingerlings 12 to 42 mm in total length ranged from 31% to 38% sea water. Bluegill eggs were fertilized in concentrations from 0% to 19% sea water. These concentrations appeared to have no effect on the success of hatching. The 11-day TL_m for the hatched bluegill fry was 13% sea water; the 96-hour TL_m for fingerlings ranged from 29% to 30% sea water. (Authors)

6875. Booke, Henry E. (New York State Cons. Dept., Cortland). 1964. BLOOD SERUM PROTEIN AND CALCIUM LEVELS IN YEARLING BROOK TROUT. Prog. Fish-Cult. 26(3): 107-110.

A 3-factorial experiment was designed to measure the effects of diet, sex, and month on total serum proteins and calcium of brook trout (Salvelinus fontinalis). Biuret and EDTA methods were used to measure the proteins and calcium, respectively. Serum proteins and calcium showed no significant effects due to diets. Serum proteins varied by season, showing increases at spawning time and during the spring and decreases before spawning and during the winter. Serum calcium increased at spawning time in the females but did not do so in the males. During other periods of the year, there was no difference between male and female trout serum calcium levels. Changes in body requirements due to growth and/or reproductive cycles are proposed as an explanation for the increases and decreases of serum protein and calcium levels. (Auth.)

6876. Sprague, John B. (Fish. Res. Bd. of Canada, St. Andrews, New Brunswick, Canada). 1964. HIGHLY ALKALINE WATER CAUSED BY ASBESTOS-CEMENT PIPELINE. Prog. Fish-Cult. 26(3): 111-114.

A mile-long iron pipeline to a fishery laboratory was replaced by asbestos-cement pipe. This increased the calcium content of the laboratory tap water and raised its pH from almost neutral to about 10. Reaction of the water's carbon dioxide with dissolved calcium hydroxide would account for high pH. The extreme effect occurs because the very soft water is a poor buffer, and perhaps also because water takes an average of 18 hours to pass through the pipeline. Values of pH were about the same 2.5 years after installation of the pipeline as they had been 1.5 years after installation. For holding fish, water was aerated vigorously, and this brought pH down to 7.3. (Auth.)

6877. Knight, Alexis E. (U. S. Bur. Sport Fish. and Wildl., Lamar, Pennsylvania). 1964. INTRACELLULAR HEMOGLOBIN CRYSTALLIZATION IN TWO CENTRARCHIDS, THE LARGEMOUTH BASS AND THE BLUEGILL. Prog. Fish-Cult. 26(3): 115-117.

Routine examination of largemouth bass (Micropterus salmoides) disclosed intracellular rod-like erythrocyte inclusions. Similar crystalline inclusions, which appeared to cause aneurisms, were observed in moribund bluegills (Lepomis macrochirus). As identical crystals had been reported in moribund eels (Anguilla rostrata), 6 largemouth bass and 25 bluegills were examined. Only 3 of the bluegills and none of the bass had crystals within the erythrocytes. Artificially induced hemoglobin crystals were observed and these were identical to the inclusions in bass, bluegill and eel erythrocytes. Low metabolic rates and anemia are suggested as contributing to hemoglobin crystallization in live fish. (Auth.)

6878. Rabb, L., J. W. Cornick, and L. A. McDermott (Ontario Agricultural Coll., Guelph, Canada). 1964. A MACROSCOPIC-SLIDE AGGLUTINATION TEST FOR THE PRESUMPTIVE DIAGNOSIS OF FURUNCULOSIS IN FISH. Prog. Fish-Cult. 26(3): 118-120.

Two chicken antisera were developed against Aeromonas salmonicida, the causative agent of furunculosis in fish. Both sera were highly specific for this bacterium and useful in its preliminary identification when used in a macroscopic-slide agglutination test. (L. Rabb)

6879. Lewis, William M., and John G. Nickum (Southern Illinois Univ., Carbondale). 1964. THE EFFECT OF POSTHODIPLOSTOMUM MINIMUM UPON THE BODY WEIGHT OF THE BLUEGILL. Prog. Fish-Cult. 26(3): 121-123.

Posthodiplostomum minimum is a common trematode parasite of warm-water fishes. Metacercariae of this parasite often produce a high level of infection in fish populations. The present work is an analysis of the relation between the degree of parasitism by this trematode and the K values of samples of bluegills (Lepomis macrochirus) from 6 southern Illinois lakes. Correlation coefficient values indicate no correlation between level of infection and relative plumpness of the bluegill. (W. M. Lewis)

6880. Anderson, Richard O. (Michigan Dept. of Cons., Mattawan). 1964. A SUGAR-FLOTATION METHOD OF PICKING TROUT EGGS. Prog. Fish-Cult. 26(3): 124-126.

A procedure utilizing a sugar solution to sort dead or infertile eggs from eyed trout eggs is described. The flotation technique removes up to 97% of the dead eggs in approximately 10% of the time required for hand picking. (Auth.)

6881. Lowry, Gerald R. (Oregon State Game Comm., Corvallis). 1964. SOME WAYS OF INCREASING THE UTILITY OF A BACKPACK FISH SHOCKER. Prog. Fish-Cult. 26(3): 127-130.

Improvements made in a pulsating direct-current backpack fish shocker are evaluated and summarized. Satisfactory results in small soft-water streams are noted. Methods of assembling safe and utilitarian terminal gear for the device are described. A meter to sample current density is described, and other accessory equipment and changes in the basic unit are outlined. (Auth.)

6882. Brigham, Robert K., and Albert C. Jensen (U. S. Bur. Comm. Fish., Woods Hole, Mass.). 1964. PHOTOGRAPHING OTOLITHS AND SCALES. Prog. Fish-Cult. 26(3): 131-135.

Whole and cross-sectioned otoliths are photographed with an extreme-closeup camera using fine-grain, high-contrast film. Plastic impressions of scales are photographed with a reflex projector used as a camera. Technical details of film types, exposures, and developing procedures are given. (R. K. Brigham)

6883. Lemke, Armond E. (U. S. Public Health Serv., Cincinnati, Ohio). 1964. A NEW DESIGN FOR CONSTANT-FLOW TEST CHAMBERS. Prog. Fish-Cult. 26(3): 136-138.

A constant-flow test chamber made with 3 sides of stainless steel and 1 side of glass for use in bioassay work on fish.

6884. Zimmer, Paul D. (U. S. Bur. Comm. Fish., Portland, Oregon). 1964. A SALMON AND STEELHEAD EGG INCUBATION BOX. Prog. Fish-Cult. 26(3): 139-142.

A portable incubation box has been devised which provides for hatching salmon or steelhead eggs in gravel under simulated natural stream conditions and permits emerging free-swimming fry to enter the stream at will. (Auth.)

6885. Meehan, William R. (Dept. of Fish and Game, Kodiak, Alaska). 1964. INFECTION IN A JUVENILE COHO SALMON RESULTING FROM INGESTION OF A THREESPINE STICKLEBACK. Prog. Fish-Cult. 26(3): 142-143.

6886. Lopinot, A. C. (Illinois Dept. of Cons., Springfield). 1964. A LENGTH-FREQUENCY MEASURING BOARD FOR FISH MANAGERS. Prog. Fish-Cult. 26(3): 120.

6887. Boyd, Claude E. (Mississippi State Univ., State College). 1964. INSECTICIDES CAUSE MOSQUITOFISH TO ABORT. Prog. Fish-Cult. 26(3): 138.

6888. Bailey, Jack E. (U. S. Bur. Comm. Fish., Auke Bay, Alaska). 1964. RUSSIAN THEORIES ON THE INFERIOR QUALITY OF HATCHERY-REARED CHUM SALMON FRY. Prog. Fish-Cult. 26(3): 130.

6889. Chapoton, Robert B. (U. S. Bur. Comm. Fish., St. Petersburg Beach, Florida). 1964. SURFACE TRAWL FOR CATCHING JUVENILE AMERICAN SHAD. Prog. Fish-Cult. 26(3): 143-144.

6890. Jensen, Kjell W. (Den Vitenskapelige Avdeling, Vollebekk, Norway). 1964. A LIBRARY SYSTEM. Prog. Fish-Cult. 26(3): 144.

6891. Fredeen, F. J. H. (Research Sta., Canada Dept. of Agric., Saskatoon, Saskatchewan, Canada). 1964. BACTERIA AS FOOD FOR BLACKFLY LARVAE (DIPTERA: SIMULIIDAE) IN LABORATORY CULTURES AND IN NATURAL STREAMS. Canadian Journal of Zoology, Vol. 42, No. 4, pp. 527-548.

Planktonic bacteria as food for filter-feeding blackfly larvae were investigated in laboratory tests and in the field. Three of the commonest blackflies in western Canada, Simulium venustum, S. verecundum, and S. vittatum, developed to adults from first-instar larvae and a fourth species, S. arcticum, developed to, or nearly to, last-instar larvae, when offered only washed suspensions of Bacillus subtilis, Aerobacter aerogenes, or Escherichia coli as food.

Average concentrations of 1.3×10^6 to 34.9×10^6 cells per ml of the gram-negative A. aerogenes allowed production of adults, with best larval growth and survival in the higher concentrations. In local streams and rivers the bacterial content ranged from 0.1×10^6 to 25.0×10^6 (av. 2.2×10^6) cells per ml. Ultraviolet irradiation of the bacteria to reduce the proportion of live cells to as low as 0.1%, near the proportion in many streams, and the use of the gram-positive B. subtilis, adversely affected survival rates of the larvae.

In certain streams bacteria and blackfly larvae apparently represented the basic trophic levels in the food web. Also, bacteria leached from soils and sewage may have been important in the development of outbreaks of S. arcticum. (Auth.)

6892. Hickman, C. P., Jr., R. A. McNabb, J. S. Nelson, E. D. Van Breemen, and D. Comfort (Dept. Zool., Univ. of Alberta, Edmonton, Albert, Canada). 1964. EFFECT OF COLD ACCLIMATION ON ELECTROLYTE DISTRIBUTION IN RAINBOW TROUT (SALMO GAIRDNERII). Canadian Journal of Zoology, Vol. 42, No. 4, pp. 577-597.

The effect of adaptation to constant low environmental temperature on water and electrolyte

distribution in skeletal muscle and brain has been studied in 2-year-old rainbow trout. Following introduction to 6° C of trout previously acclimated to 16° C, measurements were made, at intervals, of plasma Na, K, Cl, Ca, Mg, and phosphate and of brain and muscle Na, K, and Cl. Plasma, muscle, and brain tissue showed a transient but significant drop in water content during the first days of cold exposure. A coincident paradoxical increase in total body weight suggests the possibility of an osmotic withdrawal of body water by the gut contents during this period. Cl space and Cl-K space estimates of muscle extracellular space were not significantly influenced during cold acclimation. Most of the plasma electrolytes measured showed significant transient alterations in concentration.

Significant reciprocal changes in brain Na and K concentration were measured shortly after transfer to 6° C and a large (61%) increase in brain Cl concentration occurred after 3 weeks of cold adaptation.

Large, rapid but mostly transient shifts in muscle Na and K occurred. During the first 3 days of cold exposure muscle lost 61% of the Na and 30% of the K present before transfer. This loss is reflected in a rise in plasma Na and K. The possibility that the unusual efflux of intrafiber Na and K together might represent a forced extrusion of positive charge following a temperature-induced intrafiber loss of organic anions or gain of divalent cations is discussed. (Authors)

6893. McLaren, I. A. (Arctic Unit, Fish. Res. Bd. of Canada, Montreal, Quebec, Canada). 1963. ZOOPLANKTON OF LAKE HAZEN, ELLESMERE ISLAND, AND A NEARBY POND, WITH SPECIAL REFERENCE TO THE COPEPOD CYCLOPS SCUTIFER SARS. Canadian Journal of Zoology, Vol. 42, No. 4, pp. 613-629.

Zooplankton was studied in the large, high-arctic Lake Hazen and in a small nearby pond. Primary (O_2) production in Lake Hazen may have occurred largely before the ice began to melt, but was unmeasurable in summer. Primary production in the pond was about the same as in other small arctic lakes. Cyclops scutifer was overwhelmingly dominant in Lake Hazen. C. scutifer and Daphnia middendorffiana were commonest in the pond. C. scutifer is annual in Scandinavia, often with coexisting spring-born and fall-born generations. On Ellesmere Island the pond appears to contain alternating annual and biennial generations, whereas the species is strictly biennial in Lake Hazen. Numbers of C. scutifer in Lake Hazen were greatly reduced as a result of summer ice conditions between 1958 and 1961, while the rotifer Keratella hiemalis increased. Estimated mean standing crop (96 mg/m^2) and net production (1.0 mg /m^2 day) in dry weight of C. scutifer in Lake Hazen during the summer of 1958 were extremely low. In early August the crop of this species in the pond was about the same as in Lake Hazen, but net production was some 15 times as large, and other zooplankters added considerably to crop and production of the pond. (Auth.)

6894. Shirai, Kaoru (Faculty of Fish., Hokkaido Univ., Hakodate, Japan). 1964. HISTOLOGICAL STUDY ON THE OVIPOSITOR OF THE ROSE BITTERLING, RHODEUS OCELLATUS. Bulletin of the Faculty of Fisheries, Hokkaido Univ., Vol. 14, No. 4, pp. 193-198.

Histological studies have been performed on the ovipositor changes at the various stages of the sexual cycle.

The whole process of ovipositor growth can be divided into two phases: the growing phase in the prebreeding season, and the fluctuation phase in the breeding season.

The growing phase is characterized by the multiplication of the epithelial cells and fibrogenesis in the connective tissue stroma, while the latter phase by edema production and remarkable vasodilation of vessels.

The influence of an estrogen-like hormone on the ovipositor changes is discussed. (Auth. Summ.)

6895. Yamada, Juro (Faculty of Fish., Hokkaido Univ., Hakodate, Japan). 1964. ON THE FEATURE OF SCALES DEVELOPED IN THE REGENERATED SKIN OF THE GOLDFISH, WITH SPECIAL REFERENCE TO THE FORMATION OF THEIR CONCENTRIC RIDGES. Bulletin of the Faculty of Fisheries, Hokkaido Univ., Vol. 14, No. 4, pp. 199-208.

Scales developed in the regenerated skin area of the goldfish were obtained experimentally.

The general features of these "regenerated skin" scales were described, grouping them into four types, primarily, according to their superficial pattern and, secondarily, to their size and shape.

In each type, the correlation between the scale feature and the histological environment for their growth was analyzed.

The most interesting scales are those of type II because they showed a characteristic pattern in reference to the fact that they have been formed in the entirely new regenerated corium.

The superficial pattern, particularly the mean interval of concentric ridges, of the type II scales, was compared with that of the "ontogenetic" and the "replacement" (customarily called "regenerated") scales both taken from the same fish.

It was ascertained that the mean ridge interval in these three kinds of scales grows larger in the order of the "ontogenetic," the "regenerated skin" (type II), and the "replacement" scales.

The result seems to support the assumption that a pressure formed between a growing scale and the surrounding tissues would be the primary factor which causes the ridges to form. (Auth. Summ.)

6896. Kuroki, Toshiro, Hiroshi Nakayama, and Kiyohisa Ueno. 1964. STUDIES ON THE FLUORESCENT COLOR-LAMP FOR ATTRACTING OF FISH. II. UNDERWATER DISTRIBUTION OF COLOR LIGHT DENSITY AND THE FISH SCHOOLS AGGREGATED. Bulletin of the Faculty of Fisheries,

Hokkaido Univ., Vol. 14, No. 4, pp. 215-235.

One hundred Watt in-put underwater type fluorescent color lamps for attracting fish were used experimentally at eight points on Kagoshima Bay in the summer of 1957 and autumn of 1958.

Seven colors of fluorescent lamps were used; white-green, daylight white, cobalt, blue, pink, yellow, and red. Two incandescent lamps, 100W and 200W, were used to complement the fluorescent lamps.

For the purpose of determination of distribution in wave length by these lamps, at various depths (5-25m), color light densities were measured with a sensitive photometer which contained five kinds of color filters (V, B, G, Y and R).

Fish schools aggregated to lamps were investigated simultaneously by two fish echo sounders, one on a shifting skiff and the other on an anchored ship. Furthermore, sea-water temperature, salinity, and vitamin B_{12} were measured.

Under the attracting condition, fish caught by net or hook were young mackerel (Pneumatophorus japonicus, Houttuyn; body length 12-15 cm), Engraulis japonica, Trachurus japonicus, and several other species.

The results of the experiments may be summarized as follows: (a) Human sense for underwater color light is different from that in the air. The underwater sense for the red lamp shifts to the short wave length (orange) side. (b) Underwater color light densities decrease with depth and these decreasing orders seem greater on the blue side. (c) The shapes of fish schools aggregated to the lamps resemble large bowls, and these fish were very lively. It was recognized that the density of fish school was very thin under the condition of low water temperature and poor vitamin B_{12}, though quantitative relations between the attraction of fish and these conditions of the sea were not clear. (d) The nearest limit of the fish school from the lamps seems to be restrained by the density of orange light (570-620 mμ), while the farthest range from the lamps seems to be controlled by the thinness of the blue light (460-510 mμ).

These matters are connected with the information that the visual pigment (rhodopsin or chromophore) of fish retina has its maximum absorptive wave lengths at about 600 mμ and 500 mμ.

From these results, it may be concluded that the most effective kinds of color light for attracting fish under these conditions are, firstly, white-green and cobalt and, secondly, blue and daylight white. To ascertain the effectiveness further, it would be necessary to carry on more tests utilizing various color lamps and to investigate the factors of not only water temperature, chlorinity and vitamin B_{12}, but transparency, plankton and others in every test. (Authors' Abst.)

6897. Zama, Koichi, Mutsuo Hatano, and Hisanao Igarashi. 1964. LIPIDS OF SALMONOID FISHES. VII. CEPHALIN FROM LIVER OF SALMON, ONCORHYNCHUS MASU. Bulletin of the Faculty of Fisheries, Hokkaido Univ., Vol. 14, No. 4, pp. 236-242.

The cephalin fraction obtained from liver of salmon, Oncorhynchus masu, mainly consisted of phosphatidylethanolamine, phosphatidylserine and inositolphospholipids. In addition to those constituents, small amounts of contaminants, such as phosphatidylcholine, sphingolipids and acetal lipids were detected.

This cephalin fraction was fractionated into eight portions by means of silicic acid-celite (2:1, w/w) column chromatography.

Furthermore, the purification of the aminophospholipid fraction, obtained by means of silicic acid-celite column chromatography, was dinitrophenylated and then rechromatographed on silicic acid-celite column. (Authors)

6898. Paperna, Ilan (Dept. of Parasitology, Med. School, Hebrew Univ., Jerusalem). 1964. THE METAZOAN PARASITE FAUNA OF ISRAEL INLAND WATER FISHES. Bamidgeh, Vol. 16, No. 1/2, 66 pp.

In the course of a survey of the metazoan parasite fauna of inland water fishes, 116 species of parasites were found, (20 monogenetic trematodes, 13 adult digenetic trematodes, 43 metacercariae, 7 larval and adult cestodes, 15 larval and adult nematodes, 1 Acanthocephalus, 1 leech, 1 glochidium and 6 parasitic crustacea). Local parasitic fauna is characterized by a high number of fresh-water parasite species (14 out of 72 fully identified species) not yet known from other countries and possibly endemic to western Asia or even to water basins of Israel and Syria. Ethiopian elements are probably well represented in local waters, infesting fish of African origin.

The palearctic element is poorly represented in local waters mainly by non-specific parasite species infesting endemic or west Asiatic fish species, but is secondarily enriched by introduced parasites of the European carp. The oriental element is apparently absent from local waters, although a large number of local cyprinids are of genera of oriental origin. (Auth. abst.)

6899. Moss, Melvin L., Sheila J. Jones (Dept. of Anatomy, Coll. of Physicians and Surgeons, Columbia Univ., New York), and Karl A. Piez. 1964. CALCIFIED ECTODERMAL COLLAGENS OF SHARK TOOTH ENAMEL AND TELEOST SCALE. Science, Vol. 145, No. 3635, pp. 940-941.

Amino acid analysis of protein from the enamel of shark teeth and from teleost scales shows the presence of collagens which can be classified chemically as ectodermal. This finding, together with results from a histological examination of the development of these tissues, constitutes strong evidence that both proteins are derived from the ectoderm, like the enamel of higher vertebrates. Since both are calcified, calcification cannot be a specific property of collagens of mesodermal origin alone. (Authors' Abst.)

6900. McCutcheon, F. H., and A. E. McCutcheon (Duke Univ. Marine Lab., Beaufort, N. C.). 1964. SYMBIOTIC BEHAVIOR AMONG FISHES FROM TEMPERATE OCEAN WATERS. Science, Vol. 145, No. 3635, pp. 948-949.

Symbiotic cleaning among Atlantic coastal fishes has been observed under laboratory conditions. The cleaning phenomenon may be commonplace in the natural environment along the Atlantic seaboard. The black sea bass, Centropristes striatus (Linn.), parasitized by the copepod, Lernaeenicus radiatus (Le Sueur), was cleaned by a topminnow, Fundulus heteroclitus (Linn.). The behavior was recorded by cinematography and analyzed. (Authors' Abst.)

6901. Gilbert, Perry W., Edward S. Hodgson, and Robert F. Mathewson (Cornell Univ., Ithaca, New York). 1964. ELECTROENCEPHALOGRAMS OF SHARKS. Science, Vol. 145, No. 3635, pp. 949-951.

Patterns of electrical potentials recorded from the brains of sharks exhibit definite relationships to chemical and visual stimuli. Forebrain potentials reflect olfactory processes. Both restrained and free-swimming sharks exhibit mesencephalic responses to light and neural triggering of respiratory reflexes from the medulla. Early evolution of typical vertebrate brain functions, with emphasis upon chemoreception, is indicated. (Authors' Abst.)

6902. Shireman, Jerome V. (Dept. of Zool., Tulane Univ., New Orleans, Louisiana). 1964. CARASSOTREMA MUGILICOLA, A NEW HAPLOPORID TREMATODE FROM THE STRIPED MULLET, MUGIL CEPHALUS, IN LOUISIANA. The Journal of Parasitology, Vol. 50, No. 4, pp. 555-556.

Carassotrema mugilicola, a new haploporid trematode, is described from the intestine of the striped mullet, Mugil cephalus Linnaeus, and is compared with C. koreanum Park, 1938, the only other species in the genus. Pseudohapladena Yamaguti, 1952, is mentioned as a possible synonym of Carassotrema Park, 1938. The role of the host ecology in linking marine and fresh-water trematodes is discussed briefly. (Auth. Abst.)

6903. Laurs, R. Michael, and James E. McCauley (Dept. of Oceanog., Oregon State Univ., Corvallis). 1964. A NEW ACANTHOCEPHALAN FROM THE PACIFIC SAURY. The Journal of Parasitology, Vol. 50, No. 4, pp. 569-571.

Rhadinorhynchus cololabis is described from the intestine of the fish Cololabis saira taken off Oregon. The new species differs from other members of the genus including the closely related R. selkirki and R. trachuri by possessing only 10 to 12 rows of hooks on the proboscis. (Authors)

6904. Price, C. E., and J. D. Mizelle (Sacramento State Coll., Sacramento, California). 1964. STUDIES ON MONOGENETIC TREMATODES. XXVI. DACTYLOGYRINAE FROM CALIFORNIA WITH THE PROPOSAL OF A NEW GENUS, PELLUCIDHAPTOR. The Journal of Parasitology, Vol. 50, No. 4, pp. 572-578.

The following species are described as new: Dactylogyrus agregius from Richardsonius egregius (Girard), D. microlepidotus from Orthodon microlepidotus (Ayres) and Lavinia e. exilicauda Baird and Girard, D. orthodon from Orthodon microlepidotus (Ayres), and Pellucidhaptor pellucidhaptor from Richardsonius egregius (Girard). The following described species are recorded: Dactylogyrus anchoratus (Dujardin, 1845), D. vastator Nybelin, 1924, D. wegeneri Kulwiec, 1927 (all) from Carassius auratus (Linnaeus); and D. richardsonius Monaco and Mizelle, 1955 from Richardsonius egregius (Girard). Sixteen hooks (8 pairs) were observed in all of these species. The genus Pellucidhaptor differs from Dactylogyrus by the presence of eight pairs of haptoral hooks of the same approximate size, doubly recurved anchor points, nonconfluent intestinal crura, and anchor wings that arise on the anchor bases instead of on the anchor shafts. (Authors)

6905. Mizelle, J. D., and C. E. Price (Sacramento State Coll., Sacramento, California). 1964. STUDIES ON MONOGENETIC TREMATODES. XXVII. DACTYLOGYRID SPECIES WITH THE PROPOSAL OF UROCLEIDOIDES GEN. N. The Journal of Parasitology, Vol. 50, No. 4, pp. 579-584.

Three new species of Dactylogyrus, namely, D. leptobarbus from Leptobarbus hoevenii (Bleeker), D. maculatus from Rhinichthys osculus (Girard), and D. occidentalis from Hesperoleucus symmetricus (Baird and Girard), are described. Metahaliotrema Yamaguti, 1953, is emended to include only species with articulated bars, a condition present in the type species, M. scatophagi Yamaguti, 1953; and M. yamagutii sp. n. from Scatophagus argus (Gmelin) is described. Urocleidoides gen. n. is proposed to include Ancyrocephalinae with a sinistral vagina and a basally nonarticulate cirrus and accessory piece. Urocleidoides reticulatus sp. n. from Lebistes reticulatus (Peters) is described. (Authors)

6906. Uzmann, J. R., and S. H. Hayduk (Western Fish Disease Lab., Bur. Sport Fish. & Wildl., Sand Point Naval Air Sta., Seattle, Washington). 1964. LARVAL ECHINOCHASMUS (TREMATODA: ECHINOSTOMATIDAE) IN RAINBOW TROUT, SALMO GAIRDNERI. The Journal of Parasitology, Vol. 50, No. 4, p. 586.

Observations suggest that rainbow trout and allied salmonids may be important natural vectors of Echinochasmus milvi throughout their mutual range with Oxytrema silicula. Histopathological evidence of associated gill tissue changes shows this larva to be a significant pathogen which may at times contribute to the natural mortality of salmonid fishes.

6907. Sarig, S. (Lab. for Fish Diseases, Nir David, D. N., Israel). 1963. FISHERIES AND

FISH CULTURE IN ISRAEL IN 1962. Bamidgeh, Vol. 15, No. 4, pp. 67-78.

Total consumption of fish decreased in 1962 by 454 tons. The annual per capita consumption decreased by 0.5 kg, which is 4.8%. Local production increased from 14,924 tons in 1961 to 16,003 tons in 1962. The increment of 1097 tons constitutes an increase of 7.2% in overall production as compared to last year. In the consumption of pond fish there was a decrease this year of 0.1 kg per capita. The portion of pond fish in overall production was 57.6%, and in overall consumption 39.9%. In the production of pond fish this year there was a rise of 31 tons (0.3%). During this year 1418 dunams of new ponds were added and one settlement was canceled with its 335 dunams. The net increment is, therefore, 1083 dunams. There was a decrease of 4 kg (2%) per dunam in the yearly country-wide average yield. In pond cultured tilapia there was a rise of 53% and the portion of pond tilapia in the total catch of this fish reached 61%. In mullet culture there was a rise of 27% and their portion in the total catch reached 49%. The marketing of pond fish reached full supply during the 12 months of the year. Only 13% of all the carps marketed had an average weight of under 440 g. 83% of all the carp marketed were of an average weight of 440-660 g. (From Auth. Summ.)

6908. Hepher, B. (Fish Culture Research Sta., Dor, Israel). 1963. TEN YEARS OF RESEARCH IN FISHPOND FERTILIZATION IN ISRAEL. II. FERTILIZERS DOSE AND FREQUENCY OF FERTILIZATION. Bamidgeh, Vol. 15, No. 4, pp. 78-92.

Preliminary fertilization experiments in ponds have shown that phosphorus and nitrogen added to fishponds disappear from the pond water very quickly. This disappearance is affected to a great extent by the conditions in the pond water, such as pH and calcium concentration, rather than by the amount of fertilizers added. These conditions determine the concentration of the phosphorus and nitrogen that can remain in solution in the pond water. There is no point, therefore, in fertilization with doses higher than those which can remain in solution. These concentrations were found empirically to be 0.5 mg P/l and 2.0 mg N/l.

Five regional laboratories were established in which pond waters were analyzed and fertilization instructions were given accordingly. Though there were some regional and seasonal differences in the results of the analyses, these could be neglected and a standard fertilizers' dose was set, which took in consideration mainly the chemistry of pond water. This standard dose is 60 kg/ha superphosphate and 60 kg/ha ammonium sulfate for a pond 80 to 100 cm deep. This dose was applied every two weeks.

The application of the standard dose every week instead of every two weeks (and thus doubling the yearly amount of fertilizers), did not bring an appreciable increase in yield. In the cases where an increase was noted, the amount of fertilizers added in order to produce it was so high that it was not worthwhile economically.

Fertilization with half the standard dose every week also did not bring an increase in fish yield.

An "initial" fertilization with two double doses of fertilizers at the beginning of every growing season with no further fertilization for the rest of the season showed, in general, a lower fish yield than the fertilization with the standard dose. The results of bi-weekly weighings of fish in this "initial" fertilization treatment suggests that the interval of 2-3 weeks between the applications is the right fertilization frequency.

The application of half the standard dose of fertilizers every two weeks (and half the total amount of fertilizers) is being studied now at the Fish Culture Research Station at Dor. (Auth. Summ.)

6909. Duxbury, Alyn C. (Bingham Oceanog. Lab., Yale Univ., New Haven, Conn.). 1963. AN INVESTIGATION OF STABLE WAVES ALONG A VELOCITY SHEAR BOUNDARY IN A TWO-LAYER SEA WITH A GEOSTROPHIC FLOW REGIME. Journal of Marine Research, Vol. 21, No. 3, pp. 246-283.

The physical characteristics of a certain class of stable perturbations in an idealized oceanic current regime are investigated theoretically and compared with some observed features of the Gulf Stream. The mathematical model envisages an idealized two-layer fluid with a deep lower layer that remains essentially in static balance. The upper layer, when in equilibrium, is characterized by a region of uniform geostrophically balanced current (hence of nonuniform thickness); adjoining this is a second region of uniform thickness that is at rest. Under disturbed conditions, the kinematic (shear) boundary that delineates the two regions is subject to transverse excursions (or meanderings) associated with the vertical displacement of the interface between the upper and lower layers.

Only those disturbances with energy confined to the region of the shear boundary have been investigated in this study. Two classes of shear boundary waves occur: inertio-gravitational and quasi-geostrophic. Stable modes for both classes are found to exist over the range 0.1 to 10 in the internal Froude number. However, the range of wave lengths for stable waves is dependent upon the internal Froude number. Moreover, it is only those flow-regimes for which the internal Froude number exceeds unity that stationary meanders in the stream are possible. Although the free perturbations are dynamically stable, they are of dispersive character (the phase-speed being wavelength dependent). This implies that a general disturbance of the current boundary, as represented by a combination of many different modes, cannot remain in a permanent form. This aspect, together with the possibility of resonant coupling with the atmosphere, can lead to a growth, with time, of the disturbance and is suggestive of Gulf Stream meanders. The analysis shows that the

quasi-geostrophic modes have characteristics that are most consistent with observed meanders of the Gulf Stream. (Auth. Abst.)

6910. Kashiwada, Ken-ichi, Akio Kanazawa, and Shigeo Tachibanazono. 1964. STUDIES ON ORGANIC COMPOUNDS IN NATURAL WATER. II. ON THE SEASONAL VARIATIONS IN THE CONTENT OF NICOTINIC ACID, PANTOTHENIC ACID, BIOTIN, FOLIC ACID AND VITAMIN B_{12} IN THE WATER OF THE LAKE KASUMIGAURA. Memoirs of the Faculty of Fisheries, Kagoshima Univ., Vol. 12, No. 2, pp. 153-157.

The present paper reports a continuation of a study which deals with organic compounds in natural water. Five vitamins were identified in the water of Lake Kasumigaura, during the year 1962-1963. All of the vitamins were determined by a microbioassay method using lactic acid bacteria as the test organism. The nicotinic acid was contained in the lake water, with a high summer level (about 3 γ/l) and low winter level (about 0.3 γ/l). Similar seasonal changes of pantothenic acid and biotin content were found with a high summer level and low winter level. The folic acid content increased rapidly from July to September and reached a maximum in October, and then decreased rapidly. The content of vitamin B_{12} ranged from 5 to 28 mγ/l. There was no evidence of a special seasonal change of vitamin B_{12} content. (Authors' Abst.)

6911. Hidaka, Tomio. 1964. STUDIES ON THE MARINE BACTERIA. I. COMPARATIVE OBSERVATIONS ON THE INORGANIC SALT REQUIREMENTS OF MARINE AND TERRESTRIAL BACTERIA. Memoirs of the Faculty of Fisheries, Kagoshima Univ., Vol. 12, No. 2, pp. 135-152.

Inorganic salt requirements of 113 strains of bacteria from the sea (100 strains from sea water and 13 strains from the surface of fresh fishes) were investigated. In addition 37 strains of terrestrial bacteria and 14 strains of Vibrio parahaemolyticus were employed in the experiments.

These micro-organisms showed different mineral requirements. This was demonstrated in experiments with a basal medium (pH 7.6) which contained only 0.05 percent of peptone and 0.01 percent of yeast extract as organic matter.

Many strains from sea water were able to grow in artificial sea water media with a salt concentration ranging from 0.5 to 12 percent. In the majority of the strains, the salt concentration optimum for growth was found to be 5 to 7 percent. Terrestrial bacteria, on the other hand, showed a moderate growth without any supplement of inorganic salts to the basal medium, and the growth was almost entirely suppressed at a salt concentration of 7 percent, the optimum being 0.5 percent.

Na-, K-, Mg-, and Ca-salts as contained in sea water were necessary for the growth of marine bacteria in the basal medium but not for that of terrestrial forms; whereas, Vibrio parahaemolyticus seemed to require NaCl for their normal growth.

All the strains were tested on their growth capacity in the following five types of media during six days' incubation at 25° C. The media (pH 7.6) contained, common to all, 0.05 percent of peptone and 0.01 percent of yeast extract, which were dissolved in: (a) pure water, (b) 0.5 percent NaCl solution, (c) 3 percent NaCl solution, (d) Herbst's artificial sea water diluted sixfold, and (e) Herbst's artificial sea water.

Tested micro-organisms can be grouped into three from their growth capacity manifested in these media. One of them, which includes terrestrial bacteria, is characterized by the capacity to grow in every type of the media. Another group lacks in the capacity to grow in the (a) medium. The last one, to which the majority of marine bacteria belong, is characterized by incapability to grow in the media (a), (b), and (c).

Although organisms belonging to these three groups have been found in the sea, the writer believes that only the last-mentioned should be designated marine bacteria in the strict sense. (Auth. Abst.)

6912. Clark, Clarence F. (Ohio Div. of Wildlife, 1500 Dublin Road, Columbus, Ohio). 1964. MUSKELLUNGE IN OHIO AND ITS MANAGEMENT. Ohio Dept. of Natural Resources, Publ. W-329, 14 pp.

Although the Great Lakes' muskellunge (Esox masquinongy masquinongy Mitchell) and Ohio muskellunge (Esox masquinongy ohioensis Kirtland) were native to Ohio waters, the presence of a commercial fishery on Lake Erie resulted in more notoriety for the northern form. Both have been greatly reduced in abundance since the early eighteen hundreds; but the lake form seems to have suffered more severely than the river form. The use of muskies in Ohio's fisheries program was recommended in 1875, and an unsuccessful attempt was made to propagate them in 1876. However, the fry introduced from the Chautauqua Lake Hatchery in 1932 represented Ohio's beginnings in a muskellunge management program. Renewed interest in the species resulted in attempts to propagate the southern form in 1948, and success was attained in 1953 when 12,235 fingerlings were stocked from the Kincaid Springs Fish Farm. Attempts to propagate the northern form at the St. Mary's Fish Farm were made in an effort to stock each form in its native range of distribution. A pond-reared brood stock of each form was produced and eggs obtained from them at four to five years of age. Eggs produced by such breeders of the southern form have been superior in quality to those obtained from wild breeders; and a difference in quality of eggs from individual reservoirs was noted. Production has appeared to be dependent upon water temperatures which are high enough to initiate a crop of plankton followed by minnows in May, and low enough in June and July to remain below 75° to 80° F. Warmwater fish farms become too warm in hot years for the muskellunge and spring-fed ponds may remain too cold to produce forage in cold years.

The results from stocking the northern form has been negligible. The most efficient use of fry of the southern form has been in stocking reservoirs which were filled during the winter prior to stocking. Otherwise, they proved to be of little value in a stocking program. The best success from muskellunge stocking was obtained from three-inch-plus fingerlings. A positive return of 11.6 percent was obtained at Piedmont Reservoir. The reluctance of anglers to report their trophies has minimized the returns throughout the state and seriously affected efforts to evaluate the program. No natural reproduction by established populations has been found. The use of muskies as predators to control overpopulations of pan fish was attempted on a 13 acre lake. The limited data indicates no desirable results but suggests that the largemouth bass population was depressed. (Auth. Abst.)

6913. Hotchkiss, Neil (Patuxent Wildlife Research Center, Div. of Wildl. Res., Laurel, Maryland). 1964. PONDWEEDS AND PONDWEEDLIKE PLANTS OF EASTERN NORTH AMERICA. U. S. Fish and Wildlife Service, Circular 187, 30 pp.

Twenty-seven pondweeds and thirteen non-pondweeds are described in this publication, the first of a series on the field identification of marsh and water plants of eastern North America.

6914. Tarasyuk, Boris. 1963. THE SALMON FISHERY IN THE USSR. The Atlantic Salmon Journal, No. 3, pp. 18-20.

Fishery organizations of the Soviet Far East are concerned with the problem of increasing the stock of pink, chum, sockeye, chinook, and coho salmon. Fishing regulations strictly time-limit the catch of salmon in the waters of the Soviet Union. Fishing is prohibited during the spawning season (June to November) in all rivers which empty into the northern Pacific Ocean, East Siberian, Chukotsk, Okhotsk, and Bering Seas. Thirty-five fishery improvement, fish control, and observation stations are engaged in assessing the escapement of spawners into the rivers, estimating the numbers of spawners in the spawning grounds, checking egg survival and release of fingerlings, and determining what spawning ground improvement is necessary. In 1961 stream improvement costs amounted to 600,000 rubles and more than 150,000 cubic meters of earth were excavated to clear spawning grounds. Twenty-nine hatcheries are in operation, with a production and release of 412.3 millions of fingerlings in 1962. Soviet fish culturists are of the opinion that the most important condition for preserving and increasing the stock of valuable fish is the escapement of a sufficient number of spawners to the spawning grounds.

6915. Nahhas, F. M., and R. M. Cable (Dept. of Biol. Sci., Purdue Univ., Lafayette, Indiana). 1963. DIGENETIC AND ASPIDOGASTRID TREMATODES FROM MARINE FISHES OF CURACAO AND JAMAICA. Tulane Studies in Zoology, Vol. 11, No. 5, pp. 169-228.

This paper concerns adult digenetic trematodes parasitizing marine fishes of Curacao and Jamaica and is a continuation of a study begun by R. M. Cable in Puerto Rico in 1951. The purpose of the study was twofold: (1) the examination of as many shallow-water fishes as possible, with emphasis on duplicate or congeneric species from the two localities, and (2) the study of cercariae and as many of their life histories as time and facilities permitted. In this study 1527 fishes, representing 185 species, were examined. Of these, 698 individuals belonging to 124 species were collected in Curacao, and 829 representing 127 species in Jamaica. Common to both localities were 68 species, of which 5 harbored no endoparasitic trematodes. The same was true of 34 species in Curacao and 21 in Jamaica. Usually, but not always, species negative for parasites were represented by individuals that were immature or few in number.

Fishes from both localities yielded a total of 178 species of mature aspidogastrid and digenetic trematodes. Of these, 100 were found in Curacao and 140 in Jamaica, with 62 common to both localities. Included were 40 new species, of which 20 occurred in Curacao and 25 in Jamaica, with 5 common to both. Descriptions of 39 new species are presented along with a discussion of the trematode fauna of Caribbean fishes. The system of La Rue (1957) is used for higher taxa, with a major revision concerning the position of the acanthocolpids in his system.

6916. Lennon, Robert E., and Charles R. Walker (Bur. Sport Fish. & Wildl., La Crosse, Wisconsin). 1964. LABORATORIES AND METHODS FOR SCREENING FISH-CONTROL CHEMICALS. U. S. Fish and Wildlife Service, Circular 185, 15 pp.

This report describes the physical and technical facilities and the procedures of the Fish Control Laboratories at La Crosse, Wisconsin, and Warm Springs, Georgia. The laboratories emphasize screening of chemicals to find a variety of fishery management tools. Preliminary Screening ascertains whether a chemical in three concentrations has a desirable biological activity on eight species of fish in reconstituted water at 12° and 17° C. Delineative Screening ascertains effective concentrations (EC100) on eight species in reconstituted water (the method for which is described) at 12°, 17°, 22°, and 27°. Intensive Screening of promising fish-control agents ascertains effects on 24 species of fish and on other aquatic organisms, at different temperatures and in waters of various qualities, in the laboratory and in the field. (Authors' Abst.)

6917. Walker, Charles R., Robert E. Lennon, and Bernard L. Berger (Bur. Sport Fish. & Wildl., La Crosse, Wisconsin). 1964. PRELIMINARY OBSERVATIONS ON THE TOXICITY OF ANTIMYCIN A TO FISH AND OTHER AQUATIC ANIMALS. U. S. Fish and Wildlife Service, Circular 186, 18 pp.

Antimycin A, an antifungal antibiotic, has been suggested for use as a fish toxicant. Preliminary

tests were made to evaluate its effects at concentrations of 0.01 to 120 p.p.b. on 24 species of fresh-water fish in the laboratory and 25 species in outdoor pools. Responses of a select group of other animals and aquatic plants are discussed. The antibiotic is a powerful fish toxicant. Carp and other rough fish were killed by small concentrations in short exposures at cool and warm temperatures. Longnose gar, bowfin, black bullheads, and yellow bullheads were relatively resistant to the quantities tested. Plankton, aquatic plants, bottom fauna, salamanders, tadpoles, and turtles were not harmed by piscicidal concentrations. Antimycin A degrades rapidly in water, especially in the presence of free hydroxide. Detoxification occurred within 24 to 96 hours. Further studies are planned on the performance of antimycin A against various life stages of fish, on other aquatic animals, and in waters of differing qualities and temperatures. The process of detoxification and the fate of residues deserve further attention. (Authors' Abst.)

6918. Brown, Edward H., Jr. (Edited by Kenneth R. Roberts) (Ohio Div. of Wildl., 1500 Dublin Rd., Columbus). 1964. FISH ACTIVATION WITH COPPER SULFATE IN RELATION TO FYKE NETTING AND ANGLING. Ohio Div. of Wildlife, Publication W-71, 13 pp.

Copper sulfate applications ranging in concentration from 0.5 to 3 ppm were followed by increased catch rates by fyke nets in 32 of 33 separate nettings to 20 Ohio lakes. Based on summation of all nettings, the grand total catch after treatment slightly more than doubled the grand total catch before treatment. The results can be expected to vary with species, just as habits and characteristics of species vary. In the summation of data for the 33 fyke nettings, increase in catch after chemical treatment ranged from 1.4 times for crappies to 4.2 times for sunfish, excluding a questionable increase of 8.6 times for carp. Largemouth bass, a species generally netted at comparatively low rates, exhibited the 2nd highest grand total increase of 3.6 times after copper sulfate was added. The irritant effect of copper sulfate on fish appears to be rather short-lived, so that successive treatments are required for sustained effects.

In relation to fyke netting, enough is now known about the influence of $CuSO_4$ on fish activity to make it a practical tool where increased catch rates are desired, especially for species that normally are less susceptible to capture in nets.

However, an attempt to establish a precise set of standards to take the place of rules-of-thumb would have to include careful consideration of the following conditions: (1) temperature, (2) water hardness, (3) time of year, (4) individual physical and biological characteristics of lakes, and (5) variabilities inherent in fyke netting. Therefore, the soundest and most economical approach to additional experimentation would probably involve laboratory testing, wherein the preceding conditions could be controlled and varied at will and where reactions of fish could be observed and measured.

6919. Power, E. A. (U. S. Bur. Comm. Fish., Washington, D. C.). 1963. FISHERY STATISTICS OF THE UNITED STATES - 1961. U. S. Fish and Wildlife Service, Statistical Digest No. 54, 460 pp. Avail.: Supt. Documents, U. S. Government Printing Office, Washington, D. C. ($2.00).

A review of the fishery statistics for the year 1961 collected by the Branch of Statistics, Division of Resource Development. Included are data on the volume and value of the catch of fishery products, employment in the fisheries, quantity of gear operated, number of fishing craft employed, and information on the volume and value of the production of manufactured fishery products and by-products.

6920. Springer, Paul F. (Cooperative Wildlife Research Unit, South Dakota State Coll., Brookings). 1963. FISH AND WILDLIFE ASPECTS OF CHEMICAL MOSQUITO CONTROL. Proc. of the Fiftieth Annual Meeting of the New Jersey Mosquito Extermination Assn., pp. 194-203.

Certain chemicals used for mosquito control can be hazardous to valuable fish and wildlife resources, particularly when these chemicals are applied repeatedly or in large amounts. Findings of laboratory and field studies with standard mosquito control toxicants are summarized under major groups of plant and animal life. Crustaceans, which are closely related to insects, and which contain several commercially important species, are very susceptible to chemical poisoning. Although direct poisoning is the most obvious influence of insecticides, indirect harm can result to higher animals by concentration of chemicals in their passage through food chains or by reduction of important food-chain organisms. Adherence to basic rules will reduce wildlife losses from chemical mosquito control programs. (Auth. Summ.)

6921. Suzuki, Ryo (Dept. of Biol., Aichi Gakugei Univ., Okazaki, Japan). 1963. HYBRIDIZATION EXPERIMENTS IN CYPRINID FISHES. VI. RECIPROCAL CROSSES BETWEEN GNATHOPOGON ELONGATUS ELONGATUS AND GNATHOPOGON JAPONICUS. Japanese Journal of Ichthyology, Vol. X, Nos. 2/6, pp. 39-42.

Artificial interspecific hybrids, Gnathopogon elongatus elongatus ♀ X Gnathopogon japonicus ♂ and the reverse cross, can be reared until they reach the adult stage with a survival rate similar to that of controls. Their external characters are typically intermediate between parental species. Of nine hybrids reared to adulthood, two are sterile males and another seven are females, three of them having a few unripe ovarian eggs. (Auth.)

6922. Waldron, Kenneth D. (Bur. Comm. Fish. Biol. Lab., Honolulu, Hawaii). 1964. FISH SCHOOLS AND BIRD FLOCKS IN THE CENTRAL PACIFIC OCEAN, 1950-1961. U. S. Fish and Wildlife Service, Special Scientific Report--Fisheries

No. 464, 20 pp.

This report contains a summary of the results of visual observations of bird flocks and fish schools in a portion of the central Pacific Ocean bounded by latitudes 20° S and 30° N, and longitudes 110° W and 180°. Observations made by biologists and fishermen aboard vessels of the Bureau of Commercial Fisheries Biological Laboratory in Honolulu from 1950 to 1961 are summarized in a series of 12 charts. Each chart covers a 3-month period and shows the hours scouted and the sightings per 10 hours of scouting for total bird flocks, total fish schools, and skipjack tuna schools within areas measuring 5 degrees of latitude by 5 degrees of longitude. Seasonal and areal differences in rate of sighting are apparent, with the highest rates appearing in the vicinity of the Marquesas Islands in the South Pacific Ocean. (Auth. Abst.)

6923. Atz, James W. (New York Aquarium, New York Zool. Soc., Brooklyn, New York). 1964. SOME PRINCIPLES AND PRACTICES OF WATER MANAGEMENT FOR MARINE AQUARIUMS. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 3-16.

Instability of sea water and its organic constituents, when confined in aquariums or circulatory systems, and the characteristic inability of marine organisms to adjust to changes in their environment, combine to make the keeping of marine life in captivity a difficult procedure. The maintenance of sea water in suitable condition depends upon a chemically inert water system, a low ratio of animal life to volume of water, the control of bacteria, and the elimination of metabolic waste products. Methods used to accomplish this include aeration, filtration, storage in the dark, and treatment with alkalizers, ultraviolet light, and antibiotics. (Auth. Abst.)

6924. Segedi, Richard, and William E. Kelley (The Cleveland Aquarium, Cleveland, Ohio). 1964. A NEW FORMULA FOR ARTIFICIAL SEA WATER. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 17-20.

An artificial substitute for sea water is offered which has performed well in keeping both vertebrates and invertebrates at the Cleveland Aquarium. The formula is assembled and stored for convenient use as a 4-part preparation. (Authors' Abst.)

6925. Thomas, H. J. (Dept. of Agric. & Fish. for Scotland, Marine Lab., Aberdeen, Scotland). 1964. NOTES FROM THE AQUARIUM OF THE MARINE LABORATORY, ABERDEEN. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 21-28.

The closed circulation system described comprises twin reservoir tanks, service tank, header tank, display tanks, and filter bed. Special features include construction in water-tightened concrete with vulcanite-lined cast-iron or alkathene tubing, reservoir tank capacity five times that of the display tanks, aerator pump which is water sealed, and the use of marble chips in the filter bed. The aquarium is furnished with several levels of temperature control to allow maintenance of the appropriate seasonal sea temperature. Isolation tanks are provided for experiments which might involve risks if undertaken in the main system. (Auth. Abst.)

6926. Gordon, M. S., and R. A. Boolootian (Dept. Zool., Univ. California, Los Angeles). 1964. A CLOSED CIRCULATING SEA-WATER SYSTEM. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 29-34.

The closed circulating sea-water system of the Department of Zoology, University of California at Los Angeles, is described, and some parts are illustrated. Some important changes which would improve system operation are listed. These include changes in construction materials for large water tanks and sea-water return lines, and changes in the types of pumps. (Authors' Abst.)

6927. McInerney, J. E., and W. S. Hoar (Dept. Zool., Univ. British Columbia, Vancouver, B. C., Canada). 1964. A MEDIUM-SIZED SEA-WATER SYSTEM FOR THE LABORATORY. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 35-38.

A simple and efficient salt-water system which may be easily constructed from readily available materials is described. Various ways of solving the problems of contamination, aeration, removal of waste products, and temperature maintenance are considered. (Authors' Abst.)

6928. Breder, C. M., Jr. (The American Museum of Natural History, New York, N. Y.). 1964. MINIATURE CIRCULATING SYSTEMS FOR SMALL LABORATORY AQUARIUMS. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 39-54.

Methods are given for constructing both an open system, wherein the sea water runs to waste, and a closed system, wherein the water is recirculated. Easily available materials are used, and all devices, such as a constant-level siphon and an automatic shutoff, are simple to assemble. Each of the systems is designed so as to require a minimum of maintenance. Equipment necessary for the control of sea water is discussed. (Auth. Abst.)

6929. Plessis, Yves B. (National Museum of Natural History, Paris, France). 1964. MARINE AQUARIUM PROCEDURES AND TECHNIQUES. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 55-68.

A closed-circuit system is used as the most dependable means of maintaining a balance of

physical and chemical factors with a minimum of attention and maintenance. Several appliances as adjuncts to this system are discussed in detail, e. g., exhausting devices and capillary siphons which produce artificial tides. A special habitat for the breeding of intertidal animals in the laboratory, and a sand-bottom tank, designed from an esthetic point of view for public exhibition, are described. (Auth. Abst.)

6930. Hale, L. J. (The Ashworth Lab., Univ. of Edinburgh, Edinburgh, Scotland). 1964. A FAST-FLOW CLOSED-CIRCUIT MARINE AQUARIUM. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 69-76.

A relatively fast flow of sea water results in a much greater success in keeping marine organisms in aquariums, and a closed-circuit system will remain biologically balanced without changing or filtering the sea water and without temperature control. The water is actively circulated by a special pump which is an elaboration of the bubbling tube. This pump has advantages over conventional pumps in the absence of corrosion and contamination and of damage to organisms passing through it; it requires little maintenance. (Auth. Abst.)

6931. Barriety, L. (Musée de la Mer, Biarritz, France). 1964. A SUBSIDIARY HOT-WATER CIRCUIT IN AN AQUARIUM FED BY AN OPEN CIRCUIT. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 77-80.

An effective method is described for recirculating and filtering heated sea water, in order to alleviate the thermal loss entailed when warmed water is wasted. (Auth. Abst.)

6932. Shelbourne, J. E. (Ministry of Agriculture, Fisheries, and Food Fisheries Lab., Lowestoft, Suffolk, England). 1964. EXPERIMENTAL SEA-WATER SYSTEMS FOR REARING FISH LARVAE. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 81-94.

Marine fish are not easy to rear in aquariums, but encouraging results have been achieved for the plaice (Pleuronectes platessa) in closed circulation at Lowestoft. Two temperature-controlled sea-water systems are described, both using illuminated green algae for metabolite regulation, and one having a measure of bacterial control by ultraviolet light. Survival is better in open circulation where metabolite accumulations are less severe. Two further hatchery systems are outlined; one delivering a continuous flow of filtered and temperature-adjusted sea water for local experimental use, and the other for conducting long-term experiments on chemical factors affecting egg and larval survival. (Auth. Abst.)

6933. Cargo, David G. (Natural Resources Inst. of the Univ. of Maryland, Solomons). 1964. ESTUARINE WATER SYSTEMS AT SOLOMONS, MARYLAND. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 103-112.

The novel features of two salt-water systems at Solomons, Maryland, are discussed. Details of the straight-through rising-pipe supply system, progressing cavity pumps, constant-head trough distribution system, and tank arrangements are included. Drawings of these and other associated details are set forth along with a brief evaluation of the two systems and the maintenance schedule employed. A list of sources of equipment is included. (Auth. Abst.)

6934. Wisby, Warren (Univ. of Miami Marine Lab., Miami, Florida). 1964. SEA-WATER SUPPLY IN THE TROPICS. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 113-118.

The existing sea-water system is described for institutions in need of a moderate supply of sea water. Special methods were devised to eliminate frequent maintenance, save space, accommodate an extremely high ground-water level, and permit continuous operation in spite of tropical storms. Additions and changes for a contemplated enlarged facility are discussed, covering the control of temperature, salinity, pH, dissolved oxygen and CO_2, and turbidity in the incoming water. Methods are given whereby programed variations of any controllable parameter may be maintained. (Auth. Abst.)

6935. Talbot, G. B. (Tiburon Marine Lab., Box 98, Tiburon, California). 1964. SALT-WATER SYSTEM AT THE U. S. BIOLOGICAL LABORATORY, BEAUFORT, NORTH CAROLINA. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 119-124.

In conjunction with the construction of a modern laboratory at Beaufort, N. C., a new salt-water system was built, since the one in existence, an aged pump-and-tank intermittent facility, had proved inadequate. The system chosen was a continuous-flow type, installed in duplicate, utilizing a 3-horsepower centrifugal pump, flexible polyethylene pipes, and hard-rubber valves. Indoor water tables are constructed of cypress planks lined with sheet lead and of 3/4-inch plywood covered with fiberglass. Outdoor tanks are of concrete and may be divided into four compartments by screen partitions. The system has been in continual use since 1955 and provides an uninterrupted flow of salt water, at constant pressure, regardless of valve actuation. (Auth. Abst.)

6936. Mann, D. S., D. W. McLeese, and L. R. Day (Fish. Res. Bd. of Canada, Biol. Sta., St. Andrews, New Brunswick, Canada). 1964. SALT-WATER SYSTEM AT THE ST. ANDREWS BIOLOGICAL STATION OF THE FISHERIES RESEARCH BOARD OF CANADA. Sea-Water Systems for

Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 125-130.

Submerged stainless-steel and aluminum-alloy pumps supply salt water through nontoxic plastic piping and fittings to laboratory facilities, and to a 30,000-gallon header tank through a partially effective antisurge unit. Straight runs and T-joints in piping facilitate cleaning. Hot salt water for blending in temperature experiments is produced in a stainless-steel head exchanger in an oil-fired freshwater boiler. Expansion valves at compressed-air pumps prevent toxic ions from passing through the copper air-distribution system. (Authors' Abst.)

6937. Fernald, Robert L. (Friday Harbor Laboratories, Univ. Washington, San Juan Island). 1964. SEA-WATER SYSTEMS AT THE FRIDAY HARBOR LABORATORIES OF THE UNIVERSITY OF WASHINGTON. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 131-136.

The Friday Harbor Laboratories are on San Juan Island, Wash., in an area where the sea water is relatively free from industrial pollution and fresh-water runoff. Three separate sea-water systems are in operation. Two have glass piping over the span of 1,500 feet from pumps to laboratories; the third has polyethylene piping. Each has a hard-rubber centrifugal pump; a 250-gallon, glass-lined receiving tank maintains a constant head of pressure in the laboratories. The water enters the laboratories with little or no change in temperature, or fauna. (Auth. Abst.)

6938. Snow, C. Dale (Research Lab., Oregon Fish Comm., Newport). 1964. OREGON FISH COMMISSION'S SALT-WATER SYSTEM AT NEWPORT, OREGON. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 137-140.

This paper describes a simple salt-water system used at the Oregon Fish Commission's shellfish-research laboratory at Newport, Oregon, and discusses some of the problems in maintaining and operating such systems. (Auth.)

6939. DeLacy, Allan C. (Univ. of Washington, Seattle). 1964. AN ANNULAR TANK FOR SEA FISHES. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 141-142.

The College of Fisheries of the University of Washington maintains an 8,000-gallon recirculating sea-water system. A 2,000-gallon annular tank has enhanced growth and longevity of certain fish species. Light and temperature control afford flexibility in establishing artificial environments. (Auth.)

6940. Joice, Donald K., and Demorest Davenport (Dept. of Biol. Sci., Univ. California, Santa Barbara). 1964. SEA-WATER SYSTEM OF THE MARINE LABORATORY OF THE UNIVERSITY OF CALIFORNIA, SANTA BARBARA. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 143-146.

The sea-water intake system of the Marine Laboratory of the University of California, Santa Barbara, lies in the tidal zone of the campus beach. The 48-square-foot filter, a concrete box filled with graded aggregates and having a perforated collection header at the bottom, is located at low-tide level. The filtered water is carried to the laboratory through a buried pipe under the suction of a shore-based jet pump. As a cleaning device, the surf's constant agitation of the beach sand over the filter has contributed to giving an uninterrupted, maintenance-free service of 35 gallons per minute for over 4 years. (Authors)

6941. Lindsay, C. E. (State of Washington Dept. of Fisheries, Brinnon). 1964. SEA-WATER SYSTEM AT THE POINT WHITNEY SHELLFISH LABORATORY. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 147-154.

A description of the original sea-water system of the Point Whitney Shellfish Research Laboratory of the Washington State Department of Fisheries includes local hydrographic conditions, piping, storage, pumps, distribution facilities, automatic controls, and provisions for cleaning. Considerations of cost, toxicity, materials available, and dependability determined the design. Although many of the operational problems inherent in this type of installation were solved initially, additional ones came to light with operation of the system. Some of these were subsequently eliminated by modification of various components, and others simply borne as limitations of the system. Later additions to the storage facilities and piping utilized new nontoxic plastics to expand capacity and versatility and eliminate damage from boring and fouling organisms. The effect of green concrete on quality of water was recognized. Recommendations for improvements to the present system and for development of a new system are made. (Auth. Abst.)

6942. Walne, P. R. (Ministry of Agriculture, Fisheries, and Food, Conway, Wales). 1964. SEA-WATER SUPPLY SYSTEM IN A SHELLFISH-CULTURE LABORATORY. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 155-160.

The sea-water supply system of a set of laboratories devoted to the culture of bivalve mollusks is described. The water is distributed from roof tanks to a tank room where it is heated and enriched with phytoplankton, and to the hatchery where it is filtered and sterilized. The equipment used for heating, filtering, and automatically enriching with algal cultures is discussed. (Auth. Abst.)

6943. Strasburg, Donald W. (Biol. Lab., U. S. Bur. Comm. Fish., Honolulu, Hawaii). 1964. AN AERATING DEVICE FOR SALT WELL WATER. Sea-Water Systems for Experimental Aquariums,

U. S. Fish and Wildlife Service Research Report 63, pp. 161-168.

Salt well water appeared to be a suitable medium for captive oceanic skipjack tuna except that the available supply was devoid of dissolved oxygen. A model aerating device, whose characteristics could be varied, was used to determine the features of a definitive aerator. The aerator was a tower containing 16 perforated horizontal trays spaced 2 inches apart; the well water was pumped to the uppermost tray, from which it showered successively through those beneath, becoming 95 to 100 percent saturated with oxygen when it reached the bottom. Skipjack were later maintained in this water. (Auth. Abst.)

6944. Nakamura, Eugene L. (Biol. Lab., U. S. Bur. Comm. Fish., Honolulu, Hawaii). 1964. SALT WELL WATER FACILITIES AT THE BUREAU OF COMMERCIAL FISHERIES BIOLOGICAL LABORATORY, HONOLULU. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 169-172.

A salt well water system was developed in Honolulu to maintain skipjack tuna (Katsuwonus pelamis) in captivity. Problems encountered with the system included accumulation of rust from the cast-iron casing in the well, inability of the well to provide sufficient water for additional fish pools, inaccessibility of the aeration trays for cleaning, necessity of frequent cleanings of the fish pool due to algal growth, and inability to observe the fish closely because of wind ripples. These problems were remedied by drilling a larger well with an asbestos-cement casing, by building a new aerator with trays spaced farther apart and easily accessible, and by enclosing the new pool in a building. (Auth. Abst.)

6945. Clark, John R., and Ronald Eisler (Sandy Hook Marine Lab., Highlands, N. J.). 1964. SEA WATER FROM GROUND SOURCES. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 173-184.

Efforts to obtain sea water from a groundwater source at the Sandy Hook Marine Laboratory are described. The basic theory of occurrence of fresh and salt water in coastal sand and gravel deposits is discussed and is confirmed by the results of a test well drilled at Sandy Hook. A hypothesis is advanced to explain both an unexpected reversal of salinity gradient and contamination by ferrous hydroxide. Although plans to maintain a continuous flow were frustrated, the water, after settling (to remove iron precipitate) has been used successfully in rearing 51 species of fishes and some invertebrates. (Authors' Abst.)

6946. Hughes, John T. (Massachusetts Div. of Marine Fish., Vineyard Haven). 1964. PRACTICAL SUGGESTIONS FOR CONSTRUCTION AND MAINTENANCE OF LARGE-VOLUME SEA-WATER SYSTEMS. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 185-186.

A brief description is given of a sea-water supply system in use in a lobster hatchery and research station in a region where the winters are severe. Two electrically driven pumps supply a maximum of 900 gallons per minute to an overhead tank holding 15,000 gallons. The water flows by gravity to station aquariums. Thirty-four concise suggestions are presented to allay problems of fouling, siltation, equipment breakdown, and toxicity. (Auth. Abst.)

6947. Fish, Charles J. (Narragansett Marine Lab., Univ. of Rhode Island, Kingston, R. I.). 1964. NARRAGANSETT MARINE LABORATORY SEA-WATER SYSTEM. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 187-190.

The stormproof sea-water supply and distribution system of the University of Rhode Island's Narragansett Marine Laboratory comprises six intake wells along the shoreline, a pump well, a pipeline to an elevated receiving tank, and a distributing pipe system from tank to laboratories. The system delivers about 120 gallons a minute during pumping periods. (Auth. Abst.)

6948. Lauer, Gerald Joseph (Ph. D. Thesis, Univ. of Washington, Seattle). 1963. THE BOTTOM FAUNA OF TWO SALINE LAKES IN THE GRAND COULEE, WASHINGTON. Dissertation Abstracts, Vol. XXIV, No. 11, p. 4880. Published by: University Microfilms, Inc., 313 N. First Street, Ann Arbor, Michigan, Order No. 64-4513 (Microfilm $2.75; Xerography $9.45. 206 pp.).

6949. Fanelli, George Marion, Jr. (Ph. D. Thesis, New York Univ., New York, N. Y.). 1962. RENAL EXCRETION IN COLD-BLOODED VERTEBRATES WITH SPECIAL REFERENCE TO THE EXCRETION OF TRITIATED TETRACYCLINE. Dissertation Abstracts, Vol. XXIV, No. 2, p. 803. Published by: University Microfilms, Inc., 313 N. First Street, Ann Arbor, Michigan, Order No. 63-5292 (Microfilm $2.75; Xerography $6.00. 121 pp.).

6950. Bardack, David (Ph. D. Thesis, Univ. of Kansas, Lawrence). 1963. A REVISION OF FOSSIL AND LIVING CHIROCENTRID FISHES. Dissertation Abstracts, Vol. XXIV, No. 12, Part 1, p. 5618. Published by: University Microfilms, Inc., 313 N. First Street, Ann Arbor, Michigan, Order No. 64-6810 (Microfilm $5.45; Xerography $19.15. 425 pp.).

6951. Bond, Carl Eldon (Ph. D. Thesis, Univ. of Michigan, Ann Arbor). 1963. DISTRIBUTION AND ECOLOGY OF FRESH-WATER SCULPINS, GENUS COTTUS, IN OREGON. Dissertation Abstracts, Vol. XXIV, No. 12, Part 1, p. 5619. Published by: University Microfilms, Inc., 313 N. First Street, Ann Arbor, Michigan, Order No. 64-6653 (Microfilm $2.75; Xerography $9.00. 198 pp.).

6952. Normandeau, Donald Arthur (Ph. D. Thesis, Univ. of New Hampshire, Durham). 1963. THE LIFE HISTORY OF THE ROUND WHITEFISH, PROSOPIUM CYLINDRACEUM (PALLAS) OF NEWFOUND LAKE, N. H. Dissertation Abstracts, Vol. XXIV, No. 12, Part 1, p. 5627. Published by: University Microfilms, Inc., 313 N. First Street, Ann Arbor, Michigan, Order No. 64-206 (Microfilm $2.75; Xerography $6.20. 126 pp.).

6953. Greenberg, A. E. 1962. STREAM PLANKTON DATA PRESENTATION. Wat. & Sewage Wks, 109, 474; Water Pollution Abstracts, Vol. 37, No. 3, Abst. No. 395. 1964.

Various methods have been used for the presentation of stream plankton data, but all have the disadvantage that only two variables can be presented. To overcome this problem, an isometric plotting method, developed recently by the Ohio River Valley Water Sanitation Commission for expressing chemical data from the Ohio River, has been applied to the results of a plankton survey in the Sacramento River, California. This isometric plotting is rated as a valuable method for graphical presentation of data, examining simultaneously three variables, time, place, and plankton.

6954. Anonymous. 1963. DISSOLVED OXYGEN ANALYZER ADAPTED FOR FIELD USE. Chem. Engng. News, 41, No. 32, 44-45; Water Pollution Abstracts, Vol. 37, No. 3, Abst. No. 410. 1964.

A portable battery-operated instrument for measuring dissolved oxygen in the field has been developed by Yellow Springs Instrument Co. The instrument, which gives direct readings of dissolved oxygen in the range 0-25 ppm with an accuracy of 0.3 ppm or of oxygen saturation in the range 0-50 percent with an accuracy of 0.5 percent, consists of a Clark-type polarographic oxygen electrode and a sampling device which simplifies the calibration by overcoming problems arising from temperature, pressure and flow variations. The electrodes are a gold ring cathode embedded in a lucite block and a silver coil anode recessed in a central well; the interior of the cell is filled with an aqueous solution of potassium chloride. A thin Teflon membrane stretched across the ends of the sensor isolates the sensor elements from their environment. The sampler is designed so that simple hand action provides enough agitation and flow past the membrane.

6955. Blackburn, R. D., and L. W. Weldon (U. S. Dept. Agric., Fort Lauderdale, Florida). 1962. EVALUATION OF HERBICIDES FOR CONTROL OF AQUATIC WEEDS. Annu. Rep. Florida Agric. Exp. Stas., 257-67; Weed Abstracts, Vol. 13, No. 2, Abst. No. 440. 1964.

Alligator weed (Alternanthera philoxeroides). Fenoprop esters, either in herbicidal oil or as weighted emulsions, were generally the most effective treatment for the control of A. philoxeroides. The propylene glycol butyl ether ester of fenoprop was more effective than the butyl ether ester formulation. Dichlorprop, the most promising of the dichlorophenoxy compounds tested, and the n-butyl and 2-chloroethyl esters of 2-chloro-4-fluorophenoxyacetic acid, were more effective than 2,4-D. Adding a wetter increased the herbicidal effect of fenoprop and 2,4-D. In still-water pools, fenac sodium and fenac acetamide were effective against both floating and rooted-immersed clumps, the latter at 10# giving 99% control 9 months after treatment in 1 trial.

Water hyacinth (Eichhornia crassipes). In greenhouse trials, diquat at 2# + 0.1% wetter gave excellent control. The tertiary fatty acid amine salt of 2,4-D was approximately 50% more active than the diethanolamine salt. In field trials, amitrole-T at 1# and 2,4-D at 2 or 4# gave >90% control, initial sinking occurring 12 and 9 weeks, respectively, after treatment.

Other species. An aerial application of diquat at 0.5, 1 and 1.5# gave good control of water lettuce (Pistia stratiotes) but not of E. crassipes. Diquat applied in a canal at 2.5 ppm in June provided complete control of southern naiad (Najas guadalupensis) and coontail (Ceratophyllum sp.) for 6 months.

6956. Pierce, M. E. (Vassar Coll., Poughkeepsie, New York). 1962. A COMPARATIVE STUDY OF THE APPLICATION OF THREE WEEDICIDES, KUROSAL G, KUROSAL SL, AND A 2,4-D ESTER TO THREE AREAS IN LONG POND, DUTCHESS COUNTY, NEW YORK. Proc. 16th N. East. Weed Control Conf., 435-41, tabs. 1, bibl. 4; Weed Abstracts, Vol. 13, No. 2, Abst. No. 441. 1964.

Fenoprop-potassium (as Kurosal G and Kurosal SL) and 2,4-D ester, each at 2.2 ppm, applied on June 13 reduced or eliminated Nymphaea odorata, Brasenia sp. and Utricularia purpurea by early September. A dense floating infestation of Nuphar advena was reduced, though not completely eliminated, by two applications of Kurosal G with 3 weeks between treatment. Neither chemical affected the dissolved oxygen content or pH of the water.

6957. Lindaberry, H. L. 1962. SUMMARY OF SEVERAL AQUATHOL TREATMENTS IN NEW JERSEY WATER. Proc. 16th N. East. Weed Cont. Conf., 406-7; Weed Abstracts, Vol. 13, No. 2, Abst. No. 445. 1964.

The level of a 30-ac lake with an average depth of 4 ft, infested with Najas minor and to a lesser extent with Ceratophyllum sp., Potamogeton crispus, Nuphar sp., Elodea canadensis and green filamentous algae, was reduced by 6 in. prior to treatment with Aquathol (endothal-disodium) at 2 ppm on May 22. Excellent control of all except the latter 2 species was obtained. By mid-September, N. minor started to regrow locally. At another location Aquathol at 3 ppm applied on July 10 gave 90% control of Potamogeton crispus. A limited amount of regrowth appeared by mid-September.

6958. Frank, P. A., R. H. Hodgson, and R. D. Comes. 1963. EVALUATION OF HERBICIDES APPLIED TO SOIL FOR CONTROL OF AQUATIC WEEDS IN IRRIGATION CANALS. Weeds, 11, (2), 124-28, figs. 2, tabs. 3, bibl. 5; Weed Abstracts,

Vol. 13, No. 2, Abst. No. 447. 1964.

In field and glasshouse trials, tests were made of the activity of 91 herbicides against sago pondweed (Potamogeton pectinatus) and American pondweed (P. nodosus) grown on soil in containers. Compounds which showed activity at a rate of 20# included fenac amide and acid, dichlobenil, dichloro-o-toluic acid, 2,4-D, 2,4-DB, dazomet, dinoseb, ametryne, the S-naphthylmethyl isothiourea salt of fenoprop, octachlorocyclopentene, PCP, fenuron, PEBC, metham-sodium, α-chloro-trichlorophenylacetamide, α-chloro-trichlorophenylacetic acid, fenoprop and trilithium arsenate. The most active were fenac sodium salt and amide and dichlobenil and these compounds had good residual activity in the soil.

In field trials in E. Wyoming, fenac-sodium and -amide and fenoprop-sodium were tested in an irrigation canal. The fenac derivatives applied at 20# in autumn gave good control of water weeds and were nearly twice as effective in reducing stands as similar spring treatments. Fenoprop at 40# was less effective than the fenac derivatives at 20#. Neither formulation of fenac at 5# gave adequate control of weeds. Mechanical incorporation of the herbicides improved results, but was of doubtful value.

6959. Beaven, G. F., C. K. Rawls, and G. E. Beckett (Chesapeake Biol. Lab., Solomons, Md.). 1962. FIELD OBSERVATIONS UPON ESTUARINE ANIMALS EXPOSED TO 2,4-D. Proc. 16th N. East. Weed Control Conf., 449-58; Weed Abstracts, Vol. 13, No. 2, Abst. No. 451. 1964.

In tidal water infested with Myriophyllum spicatum, 2,4-D butoxy ethanol ester at up to 120# impregnated on attaclay granules applied on May 29 to June 1 had no effect on the % mortality of eastern oysters (Crassostrea virginica), blue crab (Callinectes sapidus) and softshell crab (Mya arenaria) up to 5 weeks after treatment, but was lethal to these species at one location where large mats of decomposing M. spicatum formed an anaerobic layer isolating organisms from well-oxygenated water. When normal aerobic conditions were maintained, 30# was non-lethal to the native macrofauna, consisting mostly of menhaden (Brevoortia tyrannis), but was ineffective against Potamogeton pectinatus, P. perfoliatus, Ruppia maritima, Vallisneria americana, Heteranthera dubia, Ceratophyllum demersum and Elodea spp.

6960. Hodgson, R. H., and N. E. Otto (Crops Res. Div., Agric. Res. Serv., U. S. Dept. Agric., Beltsville, Md.). 1963. PONDWEED GROWTH AND RESPONSE TO HERBICIDES UNDER CONTROLLED LIGHT AND TEMPERATURE. Weeds, 11, (3), 232-36, figs. 4, tabs. 3, bibl. 25; Weed Abstracts, Vol. 13, No. 2, Abst. No. 530. 1964.

Experiments were conducted in 1959 to determine the effect of light quality and intensity, culture-temperature, and plant age on the morphology and herbicidal susceptibility of Potamogeton pectinatus and P. nodosus (sago pondweed and American pondweed). Vegetative propagules cultured under a 14-hr photoperiod of various chromatic compositions developed more extensive stolon and main shoot systems and produced plants with longer internodes under red light than under blue. Plant weight, branch number and stolon development increased, while shoot length and shoot/root ratio decreased with increased light intensity. Pondweeds grown for 4 weeks under light intensities of 25 to 400 ft candles made progressively more growth as light intensity increased.

Pondweeds grown under each of 5 light intensities at temperatures of 60, 70, or 80° F were treated with emulsified xylene or alkyl tolyl methyl trimethyl-ammonium chloride. Plant injury was progressively greater at the higher light intensities and temperatures. Injury from either herbicide increased with plant age from early vegetative to flower-bud stage. Pondweeds cultured under 400 ft candles light and a 14-hr photoperiod required approximately 900 degree-days above a 49° F threshold to reach flower-bud stage. (From Auth. Summ.)

6961. Faust, S. D., R. R. Younger, R. J. Tucker, and O. M. Aly (Dept. Sanit., Rutgers Univ., New Jersey). 1962. OBSERVATIONS ON THE OCCURRENCE AND PERSISTENCE OF 2,4-D AND 2,4-DICHLOROPHENOL IN LAKE WATER. Proc. 16th N. East. Weed Control Conf., 459-65, tabs. 3, bibl. 6; Weed Abstracts, Vol. 13, No. 2, Abst. No. 550. 1964.

Analysis of lake water samples collected up to 132 days after treatment with the granular formulation of 2,4-D iso-octyl ester at 20# (equivalent to 1.34 mg/l.) showed no effect on pH, total hardness and total alkalinity, nor was there any effect on dissolved oxygen, biochemical oxygen demand, chlorine demand or color up to 70 days after treatment. The maximum concentration of 2,4-D released to the water was 49.5 μg/l., detected 13 days after treatment. No 2,4-dichlorophenol appeared to accumulate as a result of biological degradation of 2,4-D, and concentrations of 0.5-13 μg/l. found present were thought to have resulted from impurities in the commercial formulation. The experiments showed that free phenols at concentrations of 5-15 μg/l. were released to the water either by slow hydrolysis or by biological degradation, but that none of their possible chlorination products, 2-chlorophenol, 4-chlorophenol, 2,4-dichlorophenol, 2,6-dichlorophenol and 2,4,6-trichlorophenol, nor the 2,4-dichlorophenol already present affected threshold taste or odor level of the water, on assessment 132 days after treatment.

6962. Chubb, James C. (Dept. of Zoology, Univ. of Liverpool, Liverpool, England). 1963. OBSERVATIONS ON THE OCCURRENCE OF THE PLEROCERCOIDS OF TRIAENOPHORUS NODULOSUS (PALLAS, 1781) (CESTODA : PSEUDOPHYLLIDEA) IN THE PERCH PERCA FLUVIATILIS L. OF LLYN TEGID (BALA LAKE), MERIONETHSHIRE. Parasitology, Vol. 54, No. 3, pp. 481-492.

The perch was the principal host for the plerocercoid of Triaenophorus nodulosus in Llyn Tegid.

Three stages of plerocercoid development were recognized: non-encapsuled developing plerocercoids, encapsuled but living mature plerocercoids, and dead encapsuled degenerate plerocercoids.

The stomach contents of the perch were analyzed and planktonic crustaceans were found to be a significant part of the food from May to December. No change in diet in relation to length was found.

The period of occurrence of developing plerocercoids in the perch livers was March to June. This in relation to other evidence was shown to indicate the period of infection of the perch by the procercoids.

The three stages of plerocercoid development recognized were found to occur simultaneously in a few perch, and thus may represent infections acquired over three successive seasons.

There was no seasonal periodicity of occurrence of the plerocercoids in the perch. All the fish examined were more or less equally infected by plerocercoids. There was no tendency for older, longer perch to be more heavily infected.

One to five capsules, normally containing one plerocercoid each, occurred in the livers of the infected perch.

For the perch examined there was a dynamic equilibrium between establishment of procercoids from the copepod host, and loss of plerocercoids by degeneration within the perch.

The mature plerocercoids form the reservoir of infection for the definitive host of T. nodulosus, the pike, Esox lucius L. (Auth. Summ.)

6963. Welsby, V. G., J. R. Dunn (Dept. Electronic and Electrical Engineering, Univ. of Birmingham, Birmingham, England), C. J. Chapman, D. P. Sharman, and R. Priestley. 1964. FURTHER USES OF ELECTRONICALLY SCANNED SONAR IN THE INVESTIGATION OF BEHAVIOR OF FISH. Nature, Vol. 203, No. 4945, pp. 588-589.

A high-resolution sector-scanning sonar was used to examine the behavior of fish in large experimental tanks and in the vicinity of power station cooling-water intakes along the River Forth. The fish echo-traces on the sonar display screen were photographed with exposures up to three minutes. In the tank, there was a striking difference between the pattern forms obtained in daylight and darkness due to changes in the shoaling behavior of herring. When a sound stimuli was introduced at one end of the tank, the majority of the herring avoided the area of the tank in the vicinity of the sound source. In the River Forth, the scanner showed convincingly that at night there was a complete break-up of fish shoals.

6964. von Brandt, A. (Inst. for Fishing Technique and Gear Research, Hamburg, Germany). 1964. FISH CATCHING METHODS OF THE WORLD. Published by: Fishing News (Books) ltd., Ludgate House, 110 Fleet Street, London E. C. 4, England ($8.50).

The basic methods of catching fish evolved by mankind in all countries are analyzed, and these methods are related to the various gears used to apply them. Numerous illustrations, drawings, and photographs cover the field from spears and arrows to the modern whaler's gun, through traps and enclosures to the amazing variety of nets designed for the techniques employed by commercial fishermen for pelagic, midwater, and deep trawling.

6965. Walker, Charles R. (U. S. Bur. Sport Fish. and Wildlife, La Crosse, Wisconsin). 1964. SIMAZINE AND OTHER S-TRIAZINE COMPOUNDS AS AQUATIC HERBICIDES IN FISH HABITATS. Weeds 12(2): 134-139.

Simazine, atrazine, propazine, and prometone were evaluated as aquatic herbicides. Preemergent applications of 1 to 2 ppmw of granular simazine formulated with attaclay or calcium sulfate controlled Potamogeton, Najas, Ceratophyllum, Heteranthera, and Zannichellia. Higher rates were required to control filamentous algae (Cladophora and Pithophora) and Chara. Early post-emergence applications of wettable powder to submersed aquatics or filamentous algae were often effective. Atrazine gave similar results. Propazine and prometone did not control submersed species at 3 ppmw. Sprays were more effective than granules on filamentous algae. Simazine was relatively safe to fish, being less toxic than atrazine, propazine or prometone. Granular forms were less toxic than wettable powder or emulsifiable concentrates. The LD_{50} of simazine on bottom organisms in the laboratory was 28 ppmw. Field applications did not cause a serious reduction in bottom organisms. However, the control of aquatic vegetation brought about ecological changes affecting bottom dwelling and weed clinging organisms. These changes would affect certain fishes with special food habits. (Auth. Abst.)

6966. Walker, Charles R. (U. S. Bur. Sport Fish. and Wildlife, La Crosse, Wisconsin). 1964. TOXICOLOGICAL EFFECTS OF HERBICIDES ON THE FISH HABITAT. Water and Sewage Works 3(3)(4): 7 pp.

Of 72 formulations tested, acrolein, atrazine, copper compounds, dichlobenil, diquat, diuron, endothal, fenac, fenuron, monuron, neburon, silvex, simazine, TD-47, TCA-urea complexes, 2,4-D and arsenicals were found to be effective herbicides. They also can significantly alter the fishery habitat with either benefit or destruction. Chemical control of aquatic vegetation resulted in pronounced changes in limnological characteristics which were similar to those found in water receiving organic pollution. Herbicide effects upon the species composition for 17 common submersed aquatic plants were observed and the new growth or regrowth in the secondary succession were evaluated in treated ponds, lakes, and plastic enclosures. The nature of chemical and ecological changes had a measurable influence on the production and species composition of fish food organisms.

Acute toxicity was measured in laboratory bioassay on 12 species of fish. The 96-hour median tolerance limits ranged from .07 to more than 600 ppm. Use of wetting agent, emulsifier, carrier in formulation affected toxicity. Small alterations in salt or ester form or substitutions affecting the side chain markedly caused differences in effects on fish. A detailed study of a relatively toxic herbicide, TD-47, demonstrated some of the problems of residues in water, bottom fauna, and fish flesh. (Auth.)

6967. June, Fred C., and William R. Nicholson (U. S. Bur. Comm. Fish., Beaufort, North Carolina). 1964. AGE AND SIZE COMPOSITION OF THE MENHADEN CATCH ALONG THE ATLANTIC COAST OF THE UNITED STATES, 1958, WITH A BRIEF REVIEW OF THE COMMERCIAL FISHERY. U. S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 446, 40 pp.

The 1958 purse seine catch of Atlantic menhaden (Brevoortia tyrannus) was 540,000 tons, the smallest in the past 4 years; 462,000 tons were landed in the summer fishery and 78,000 tons in the North Carolina fall fishery. Total fishing effort (24,545 sets) was less than that in the previous 3 years, and the greatest reduction occurred in the Middle and North Atlantic Areas. Average catch per set was 22 tons, compared with 20 tons in 1957, and 26 tons both in 1955 and 1956.

The 1956 year-class (age-II fish) accounted for 61 percent of the catch of nearly 2.8 billion fish, while the 1957 year-class accounted for 31 percent. Age-I fish dominated the summer catch in the South Atlantic Area (68 percent); age-II fish dominated in the Chesapeake Bay (53 percent), Middle Atlantic (95 percent), and North Atlantic (53 percent) Areas; and age-0 fish dominated the North Carolina fall fishery (38 percent). In most areas, the mean length of fish in the dominant 1956 year-class (age-II fish) was less than that of the previous three year-classes at the same age. Fish of older year-classes were larger than those at identical ages in previous seasons. (Authors' Abst.)

6968. Kabata, Z. (Dept. of Agric. and Fish. for Scotland, Marine Lab., Aberdeen). 1964. REDESCRIPTION OF LERNAEOPODA CENTROSCYLLII HANSEN, 1923 (COPEPODA: LERNAEOPODIDAE). Journal of the Fisheries Research Board of Canada, Vol. 21, No. 4, pp. 681-689.

Lernaeopoda centroscyllii, a lernaeopodid copepod parasitic on Centroscyllium fabricii, and briefly described by Hansen on the basis of one damaged female specimen in 1923, has not been recorded since that date. This paper gives a detailed account of both the male and the female of the species, recently taken in Newfoundland waters. (Auth. Abst.)

6969. Vrooman, Andrew M. (U. S. Bur. Comm. Fish., Biol. Lab., La Jolla, California). 1964. SEROLOGICALLY DIFFERENTIATED SUBPOPULATIONS OF THE PACIFIC SARDINE, SARDINOPS CAERULEA. Journal of the Fisheries Research Board of Canada, Vol. 21, No. 4, pp. 691-701.

Three genetically distinct subpopulations of the Pacific sardine have been differentiated by the frequency of occurrence of a C-positive blood factor. Two of these subpopulations, a northern and a southern one, live off the coast of California and the outer coast of Baja California, Mexico. The third group inhabits the Gulf of California. The C-positive factor occurred in 13.6% of the northern subpopulation, 6.0% of the southern, and 16.8% of the Gulf subpopulation. (Auth. Abst.)

6970. Smith, Lynwood S. (Dept. of Biol., Univ. of Victoria, Victoria, B. C., Canada), and Gordon R. Bell. 1964. A TECHNIQUE FOR PROLONGED BLOOD SAMPLING IN FREE-SWIMMING SALMON. Journal of the Fisheries Research Board of Canada, Vol. 21, No. 4, pp. 711-717.

A technique is described for insertion of a cannula in the dorsal aorta of salmon for long-term blood sampling or vascular injection while the fish is confined, but free-swimming. Previous methods for single injections into the dorsal aorta are improved by a modified cannulation technique. The practicality of the technique was tested by introducing Evans Blue (T-1824) into the dorsal aorta of immature pink salmon (Oncorhynchus gorbuscha) in sea water and mature sockeye salmon (O. nerka) in fresh water to make preliminary estimates of blood volumes. It was shown that the technique can also be applied to angiography of salmon. (Authors' Abst.)

6971. Muir, Barry S. (Dept. of Zool., Univ. of Hawaii, Honolulu). 1964. VITAL STATISTICS OF ESOX MASQUINONGY IN NOGIES CREEK, ONTARIO. II. POPULATION SIZE, NATURAL MORTALITY, AND THE EFFECT OF FISHING. Journal of the Fisheries Research Board of Canada, Vol. 21, No. 4, pp. 727-746.

Several methods for the estimation of population size and natural mortality are used and evaluated, for the Nogies Creek maskinonge, with consideration being given to the sources of error and correcting factors discussed by Muir (1963a). The Schumacher tagging method and a method using only catch and average exploitation are found to be equally useful.

The same catch and exploitation method is used to estimate natural mortality and the estimates agree with those from the Beverton and Holt type method. Both methods suffer from large year-to-year errors but the 9-year average appears to be a useful statistic. Natural mortality increases with age and is about 15% per year for age IV and older and about 24% per year for age V and older.

There is only a 2-fold variation in the estimated age IV size of year-classes. The smallest of 9 year-classes was 302 and the largest was 604. No effect of fishing on subsequent year-class production could be demonstrated during the period of study. Heavy fishing did, however, remove large numbers of older fish with a resultant increase in catchability of the younger fish. (Auth. Abst.)

6972. Ackman, R. G., P. M. Jangaard, R. J. Hoyle, and H. Brockerhoff (Fish. Res. Bd. of Canada, Technological Research Lab., Halifax, N.

S.). 1964. ORIGIN OF MARINE FATTY ACIDS. I. ANALYSES OF THE FATTY ACIDS PRODUCED BY THE DIATOM SKELETONEMA COSTATUM. Journal of the Fisheries Research Board of Canada, Vol. 21, No. 4, pp. 747-756.

Analyses of the fatty acid composition of a marine diatom, Skeletonema costatum, shows that the longer-chain highly unsaturated fatty acids characteristic of fish lipids can be produced by some phytoplankton as well as through intermediary zooplankton. Comparison of cultures of various degrees of maturity indicates that the fatty acid composition of mature cultures in laboratory experiments is not necessarily typical of pelagic diatoms. The origin of atypical C_{16}-polyunsaturated fatty acids is discussed. (Auth. Abst.)

6973. Hester, Frank J. (U. S. Bur. Comm. Fish. Biol. Lab., San Diego, Calif.). 1964. EFFECTS OF FOOD SUPPLY ON FECUNDITY IN THE FEMALE GUPPY, LEBISTES RETICULATUS (PETERS). Journal of the Fisheries Research Board of Canada, Vol. 21, No. 4, pp. 757-764.

Three distinguishable size groups of oocytes are contained in the ovary of the viviparous poeciliid, Lebistes reticulatus - small, middle-sized, and large. At parturition some of the middle-sized oocytes develop into large oocytes and subsequently, upon fertilization, into embryos. The number of middle-sized oocytes is then replenished from a large store of small oocytes. The effect of changes in the amount of available food on these oocytes and, hence, on the number of offspring was explored by an experiment involving 27 female Lebistes. Rations varying from near starvation to normal were supplied over the course of three consecutive partutition periods. At the end of the third period each fish had received a different combination of the three rations. Variations in first-period rations affected the numbers of both first- and second-period offspring. Reduced numbers of offspring and reduced large and middle-sized oocyte counts were associated with reduced rations. No significant changes in the size of young or the length of the gestation period were observed. (Auth. Abst.)

6974. Bilinski, E. (Fish. Res. Bd. of Canada, Technol. Res. Lab., Vancouver 8, B. C.). 1964. BIOSYNTHESIS OF TRIMETHYLAMMONIUM COMPOUNDS IN AQUATIC ANIMALS. IV. PRECURSORS OF TRIMETHYLAMINE OXIDE AND BETAINE IN MARINE TELEOSTS. Journal of the Fisheries Research Board of Canada, Vol. 21, No. 4, pp. 765-771.

An in-vivo study was made of potential precursors of trimethylamine oxide (TMAO) in marine teleosts (lemon sole, Parophrys vetulus, and starry flounder, Platichthys stellatus). C^{14}-labelled compounds were administered intraperitoneally and the incorporation of tracer into TMAO, isolated from the whole body, was determined. Trimethylamine (TMA)-C^{14} was found to be a much better precursor than the other compounds tested. A limited labelling of TMAO was observed after administration of γ-butyrobetaine-methyl-C^{14}, betaine-methyl-C^{14} and methionine-methyl-C^{14}. There was little or no incorporation of C^{14} into TMAO after administration of methylamine-C^{14}, carnitine-methyl-C^{14}, glycine-2-C^{14}, sodium formate-C^{14}, sodium acetate-1-C^{14}, sodium acetate-2-C^{14} and $NaHCO_3$-C^{14}. The conversion of choline-methyl-C^{14} to TMAO was higher after intraperitoneal than after intramuscular injection and only trace amounts of radioactivity were found after intravenous injection. The results provide support for formation of TMAO in fish by oxidation of TMA but they give no clear indication for metabolic pathways leading to this oxidative step.

Betaine was isolated from fish after administration of choline-methyl-C^{14}, methionine-methyl-C^{14} and glycine-2-C^{14}. Evidence of extensive conversion of choline to betaine was obtained. Betaine also was found to be labelled after administration of methionine-methyl-C^{14}, but only a limited degree of labelling was observed after administration of glycine-2-C^{14}. The results indicate that betaine is formed by oxidation of choline in fish.

A modification of the Dragendorff reagent for use as a spray for detecting trimethylammonium compounds on paper chromatograms is described. (Auth. Abst.)

6975. Kohler, A. C. (Fish. Res. Bd. of Canada Biol. Sta., St. Andrews, N. B.). 1964. MOVEMENTS OF HALIBUT ON THE NOVA SCOTIAN AND GRAND BANKS. Journal of the Fisheries Research Board of Canada, Vol. 21, No. 4, pp. 837-840.

Tagging of halibut, Hippoglossus hippoglossus (Linnaeus), has been carried out incidentally to taggings of other demersal marine species by the groundfish staff of the Fisheries Research Board of Canada Biological Station, St. Andrews, since 1958. Petersen disk tags were attached by inserting a piece of stainless steel wire through the nape. There was only an 8% return of tags in the year and a half following the tagging of 707 fish in the Gully of 1962. Recaptures showed that the predominant movement was to the east of the tagging area.

6976. LeBrasseur, R. J. (Fish. Res. Bd. of Canada, Pacific Oceanographic Group, Nanaimo, B. C.). 1964. STOMACH CONTENTS OF BLUE SHARK (PRIONACE GLAUCA L.) TAKEN IN THE GULF OF ALASKA. Journal of the Fisheries Research Board of Canada, Vol. 21, No. 4, pp. 861-862.

Twenty-nine blue sharks captured in two gill net catches in July 1959 ranged in size from 76 to 137 cm (30-54 inches). The food found in their stomachs consisted of chunks of salmon (Oncorhynchus sp.), pomfret (Brama raii (Bloch)), saury (Cololabis saira (Brevoort)), lanternfish (Myctophidae), daggertooth (Anotopterus pharao Zugmayer), squid, shrimp (Hymenodora sp.), and salps (Salpa fusiformis (Cuvier)). In general, the present data suggest blue sharks are opportunistic feeders in the Gulf of Alaska. However, there is a strong suggestion that when salmon are available, as in gill

nets, blue shark may selectively feed upon them, temporarily abandoning their normal diet of small fish and squid and apparently even by-passing other fish as available as the salmon.

6977. McKenzie, R. A., and S. N. Tibbo (Fish. Res. Bd. of Canada Biol. Sta., St. Andrews, N. B.). 1964. A MORPHOMETRIC DESCRIPTION OF PORBEAGLE (LAMNA NASUS) FROM CANADIAN ATLANTIC WATERS. Journal of the Fisheries Research Board of Canada, Vol. 21, No. 4, pp. 863-864.

Total lengths of 59 specimens varied from 79 to 244 cm with males having a somewhat smaller average length (150 cm) than females (163 cm). Round weights of 41 specimens varied from 17 kg to 156 kg (average weight 75 kg). Dressed weights of 17 specimens averaged 68% of round weights. Additional measurements are presented.

6978. McKenzie, R. A., and S. N. Tibbo (Fish. Res. Bd. of Canada Biol. Sta., St. Andrews, N. B.). 1964. A MORPHOMETRIC DESCRIPTION OF BLUE SHARK (PRIONACE GLAUCA) FROM CANADIAN ATLANTIC WATERS. Journal of the Fisheries Research Board of Canada, Vol. 21, No. 4, pp. 865-866.

In 1961 and 1962, 306 blue sharks were caught with subsurface longlines during experimental fishing cruises for swordfish and tuna by the Fisheries Research Board of Canada's research vessels A. T. Cameron and Harengus. Night fishing at or close to the surface in temperatures of 12-16° C yielded the best catches. Males predominated in the catches, comprising 86% of 234 examined for sex. No females with pups were found. Total length varied from 135 to 329 cm, with males being much larger (average length 231 cm) than females (average length 182 cm). The dressed weight of smaller sharks (11-34 kg) was 63% of the round weight and that of larger sharks (54-104 kg) was 59%. Additional measurements are listed.

6979. Chaudhuri, Hiralal (Central Inland Fisheries Research Sub-station, Cuttack, India). 1963. INDUCED SPAWNING OF INDIAN CARP. Proceedings of the National Institute of Sciences of India, Vol. 29, No. 4, Part B, pp. 478-487.

In India the major carps constitute the important food fishes and are cultivated in ponds. But in pond fish culture, considerable difficulties are encountered in obtaining quality fish seed for stocking purposes as these fishes do not breed in ponds. Attempts made to induce these species to breed in ponds by injection of fish pituitary hormones have met with great success. The technique developed has clearly demonstrated that it could be profitably utilized for the large-scale production of fish seed. The success in inducing breeding of carp has also made it possible to try experiments for the improvement of stock by hybridization and selective breeding. A number of intergeneric and interspecific hybrids have been produced by artificial fertilization of eggs of various species of carp injected with fish pituitary hormones. The breeding as well as the hatching techniques have been described. The need for the popularization and extensive application of this technique throughout the country has been emphasized as it is hoped that by following the improved technique it would be possible to produce millions of fish seed of the important cultivated species so as to meet the great demand for fish seed in India. (Auth.)

6980. Isaacson, Peter A. (California Fish & Game, Terminal Island). 1964. SUMMER MOVEMENT OF THE TOADFISH, OPSANUS TAU. Ecology, Vol. 45, No. 3, pp. 655-656.

A cumulative catch method is used to estimate population size before experimental fishing in an area of toadfish abundance. Toadfish remained abundant in nearby shore areas, though they decreased markedly in successive fishing periods in the experimental site. Reduction of the toadfish stock in the experimental area is believed due to fishing pressure rather than to an offshore movement of the fish. (Auth.)

6981. Chubb, J. C., J. B. E. Awachie (Dept. of Zool., Univ. of Liverpool, Liverpool, England), and C. R. Kennedy. 1964. EVIDENCE FOR A DYNAMIC EQUILIBRIUM IN THE INCIDENCE OF CESTODA AND ACANTHOCEPHALA IN THE INTESTINES OF FRESH-WATER FISH. Nature, Vol. 203, No. 4948, pp. 986-987.

Evidence indicates that the phenomenon of a dynamic equilibrium between gain of worms from the intermediate host, and loss of worms from the intestine of the definitive host, is found in some species of Acanthocephala and Cestoda of fresh-water fishes.

6982. Ingram, William M., and Kenneth M. Mackenthun (Technical Svcs. Br., Robt. A. Taft Sanit. Engng. Center, Cincinnati, Ohio). 1963. WATER POLLUTION CONTROL; SEWAGE TREATMENT; WATER TREATMENT. U. S. Dept. Health, Education, and Welfare, Public Health Service Publication No. 1053, 142 pp.

Selected biological references on water pollution, including a number of related topics ranging from specific groups of organisms to those techniques used to determine changes in the environment and methods used in reporting data. Since sewage stabilization ponds are typically shallow lakes that undergo eutrophication at a relatively rapid and constant rate, many of the sewage treatment references are devoted to thorough investigations of pond limnology under different waste load and climatic conditions. The water treatment section is devoted primarily to references concerning organisms that occur in raw water supplies, as well as in treatment plants and distribution systems.

6983. Lieder, Ulrich (Institut für Fischereiwesen der Humboldt-Universität, Berlin, Germany). 1964. ÜBER DEN GEGENWÄRTIGEN STAND UND DIE METHODIK DER CHROMOSOMENUNTERSUCHUNGEN BEI FISCHEN. Zeitschrift für Fischerei und

deren Hilfswissenschaften, Band XI, Heft 9/10, pp. 673-684.

The present status of the chromosome research in fish and the examination procedures are described. According to results obtained by the author, the investigation of the mitoses in regeneration tissues of amputated tail fins proved to be most favorable. Because of the insignificant injury caused by this procedure, the chromosomes of valuable specimens (presumptive polyploids, hybrids, and others) may also be examined by this method. The aceto-orceine-carmine-contusion has been used for fixation and coloration.

6984. Lohnisky, Karel. 1964. DAS WACHSTUM DES BACHSAIBLINGS (SALVELINUS FONTINALIS MITCHELL 1815) IM BACHE PANČAVA (RIESENGEBIRGE) UND IM SCHWARZEN SEE BÖHMERWALD. Zeitschrift für Fischerei und deren Hilfswissenschaften, Band XI, Heft 9/10, pp. 685-707.

The author conducted a study on the growth rate of 79 brook trout (Salvelinus fontinalis Mitchill) from Czechoslovakian waters (brook Pančava, Black Lake, and impoundment Paseky at Iser) compared with data from abroad. The relative slight divergences in the growth of brook trout from the above-mentioned Czechoslovakian waters are due to heterogeneous food available. There were no remarkable differences of growth in male and female brook trout; after maturity they grow somewhat slower. The growth rate obtained in Czechoslovakia does not deviate considerably from that obtained abroad.

6985. Hensel, Karol. 1964. NAHRUNGSBIOLOGIE DES ZWERGWELSES (AMEIURUS NEBULOSUS LeSUEUR, 1819) IN EINIGEN KOLKEN DER MITTLEREN ELBE DER TSCHECHOSLOWAKEI UND BEMERKUNGEN UBER SEINE KONKURRENZBEZIEHUNGEN ZU ANDEREN FISCHEN. Zeitschrift für Fischerei und deren Hilfswissenschaften, Band XI, Heft 9/10, pp. 715-733.

The most important food components of juvenile brown bullheads are small crustacean (primarily Chydorus).

Adult brown bullheads feed on organisms living on plants, mostly on insects in the larval stage. The larvae of Chironomidae are the most important.

The different diet of juvenile and adult brown bullheads does not depend upon segregation of food but upon the environment of the fish. The transition occurs gradually.

The residues of plants found in the digestive tract of brown bullheads have been ingested by chance.

Food competition between brown bullheads and other fish in the Elbe River is attributable only to adult ones. (Auth.)

6986. Ergens, Radim. 1964. VIER NEUE ARTEN DES GENUS GYRODACTYLUS NORDMANN 1832 (MONOGENOIDEA) AUS FISCHEN DER TSCHECHOSLOWAKEI. Zeitschrift für Fischerei und deren Hilfswissenschaften, Band XI, Heft 9/10, pp. 735-741.

The scientific description and the distinction marks of four new species of the genus Gyrodactylus Nordmann 1832 from fishes of Czechoslovakia are presented as follows: Gyrodactylus macrocornis n. sp., Gyrodactylus osoblahensis n. sp., Gyrodactylus prostae n. sp., and Gyrodactylus slovacicus n. sp. (Auth.)

6987. Reichenbach-Klinke, Heinz-Hermann (Bayerischen Biologischen Versuchsanstalt (Demoll-Hofer-Institut) München, Germany). 1964. ÜBER DEN ZUSAMMENHANG UND DIE ÖKOLOGISCHE ABHANGIGKEIT ZWISCHEN KIEMEN-UND LEBER-ERKRANKUNGEN BEI SÜSSWASSERFISCHEN. Zeitschrift für Fischerei und deren Hilfswissenschaften, Band XI, Heft 9/10, pp. 747-767.

A total of 196 fresh-water fishes and several sea fishes of 25 various species have been examined for comparison if there is any connection between gill and liver diseases. The records indicate that in most cases a gill disease is symptomatic of a disease of the liver. (Auth.)

6988. Nehring, Dietwart. 1964. VERDAUUNGS-VERSUCHE AN FISCHEN NACH DER CHROMOXYD-INDIKATORMETHODE. Zeitschrift für Fischerei und deren Hilfswissenschaften, Band XI, Heft 9/10, pp. 769-777.

Chromium oxide proved to be well suited as an indicator for digestion experiments in fish. Fifteen hours following the feeding, fecal samples of three-year-old carp should be taken from the intestine. Although only a short time in water, the feces will lose a part of the nitrogenous matter and the digestion coefficient will consequently be too high. The mean digestion coefficients for rye meal amount to 81.0 in gathered fecal samples and to 80.8 in samples taken from the final section of the intestine. The experimental procedure is described. (Auth.)

6989. Bauer, Oleg. 1962. DISEASES AND PARASITES OF ZANDERS (LUCIOPERCA LUCIOPERCA L.). (KRANKHEITEN UND PARASITEN DES ZANDERS (LUCIOPERCA LUCIOPERCA L.).) Zeitschrift für Fischerei und deren Hilfswissenschaften, Band X, Heft 8/10, pp. 681-687.

A small number of the parasites of the pike-perch are specific; a large number are nonspecific. In different waters the latter may differ totally.

In natural waters the pike-perch can suffer from attack by myxosporides, Achtheres percarum and Argulus foliaceus. Trematodes can be found in large quantities, especially Bunodera lucioper-cae in the gut and Phyllodistomum angulatum in the urinary bladder. The plerocercoids of the diphyllobotrium latum are seldom found in pike-perch.

In pike-perch from various waters spotted disease tumors of the skin and a strange infectious disease of the one-summer-old fish, combined with the decomposition of the front of the head, are described.

In lakes, fry of pike-perch can suffer from the attack of Ichthyophthirius, Diplostomulum spathaceum, D. clavatum, and Argulus.

When pike-perch are settling in new waters, the number of parasites diminishes. When eggs and larva are transported, all specific parasites disappear. With fry-fish some specific parasites can be imported to the newly settled waters. (Auth.)

6990. Steffens, Werner (Institute für Fischerei der Deutschen Akademie der Landwirtschaftswissenschaften zu Berlin, Berlin-Friedrichshagen, Germany). 1962. FÜTTERUNGSVERSUCHE BEI REGENBOGENFORELLEN (SALMO GAIRDNERI). Zeitschrift für Fischerei und deren Hilfswissenschaften, Band X, Heft 8-10, pp. 731-743.

One-year-old rainbow trout (Salmo gairdneri) were fed in small experimental ponds with uncooked sea fish (gadids), fresh-water fish (mainly cyprinids) and meat from warm-blooded animals for 4 months. The amount of food was 5 percent of the fish weight in the pond. At the beginning and at the end of the experiment the feeding material and the trout were examined for their content of water, crude protein, crude fat, and crude ash. The hemoglobin content and the number of erythrocytes in the fish were also determined.

The weight increase and shape of the individual feeding groups showed no differences. For sea fish, feeding quotients of 5.3 and 5.8 (average value 5.55), for fresh-water fish 6.3-6.4 (average value 6.35) and for beef 5.7-6.0 (average value 5.85) were fixed. The chemical composition of the muscles and liver of the differently fed trout was almost the same. The feeding of uncooked beef caused a highly significant decrease in the number of erythrocytes. (Auth.)

6991. Hübner, Hermann (Zoologischen Institut der Universität Erlangen, Germany). 1961. DIE WIRBELSÄULE DES CARPFENS (CYPRINUS CARPIO L.). Zeitschrift für Fischerei und deren Hilfswissenschaften, Band X, Heft 6-7, pp. 429-505.

The study deals with establishing the histological fundamentals for determining abnormal changes in the spine of the carp. The first part includes a detailed anatomical description of the various portions of the spine.

Physiological deviations from the basic form were found, particularly in the cervical portion of the spine which shows almost no mobility. The second part of the paper deals with the development and histological structure of the vertebrae. The third part describes in greater detail the frequently occurring scoliosis in the lumbar portion of the spine. More exact anatomical and histological studies form the basis for the interpretation of scoliosis symptoms. A way for clarifying these symptoms is shown by the example of the scoliosis occurring particularly often in the lumbar portion of the spine. (Auth.)

6992. Merla, G., and H. Zelder. 1961. ZUR KENNTNIS DES EINFLUSSES EINER CHLORONITRIN-INJEKTION AUF DAS WACHSTUM VON KARPFEN (K_{2-3}) IM JAHRE 1960. Zeitschrift für Fischerei und deren Hilfswissenschaften, Band X, Heft 6/7, pp. 507-513.

In an experiment with equally heavy stocked 3-summer-old carp in one pond, it was found that the carp which were treated with chloronitrine in spring had a 13% higher weight in autumn and a 16% higher increment. The weight difference is highly significant. With injected fish the mortality was 9%; with nontreated fish, 20%. With injected carp the chloronitrine injection did not cause a significant change of correlation level between the individual stocking weight and increment as compared to the nontreated carp ($r_1 = 0.47$; $r_2 = 0.63$). The difference between both correlation coefficients was still in the probability range (error probability P = 23%).

The regression coefficient calculated for both carp groups informs us about the kind of correlation: with an increase of the individual stocking weight by 100 gram, the individual increment of the nontreated carp rose by 220 gram; of those treated with chloronitrine, by 260 gram. The difference between both values is, however, not significant, so that the kind of correlation was not found to be affected by the chloronitrine injection under the experimental conditions. (Authors)

6993. Bandt, Hans, and Dietwart Nehring. 1961. DIE TOXIKOLOGISCHE WIRKUNG VON PENTACHLORPHENOLNATRIUM UND HEXACHLOROPHEN AUF FISCHE UND NIEDERE WASSERTIERE. Zeitschrift für Fischerei und deren Hilfswissenschaften, Band X, Heft 6/7, pp. 543-548.

The authors report on their tests regarding the poisoning effect of pentachlorphenolnatrium and hexachlorophen with some aquatic animals. The threshold value of pentachlorphenolnatrium is 0.75 mg/l for Salmo gairdneri, 0.5 for Perca fluviatilis, 0.4 for Rutilus rutilus, 0.75 for Gammarus spec. and Daphnia spec., and 2.5 for Limnaea (Radix) ovata. Hexachlorophen is less noxious. The adequate threshold value is 3.6 mg/l for Perca fluviatilis, 4.5 for Rutilus rutilus, 2-3 for Gammarus spec. and Daphnia spec., and 15 for Limnaea (Radix) ovata. (Authors)

6994. Schäperclaus, W. 1961. EINFLUSS DER INJEKTION ODER VERFÜTTERUNG ANTIBIOTISCHER MITTEL AUF DAS WACHSTRUM VON KARPFEN. Zeitschrift für Fischerei und deren Hilfswissenschaften, Band X, Heft 6/7, pp. 549-559.

Injecting 2- to 3-summer-old carp by the intraperitoneal route with antibiotics (Chloramphenicol) before stocking in spring leads to a greater growth increment of the individual carp. The increase in growth varies directly with the degree of infection of the carp with Pseudomonas (Aeromonas) punctata. At the same time the body ratio of length to height decreases and the corpulence factor rises, especially when the experimental fish have been infected acutely or latently. Supplementary feeding of chloronitrine in late May or early June proved unsuccessful. The fish fed with chloronitrine grew slower than the control carp which may suggest an

adverse effect of chloronitrine. (Auth.)

6995. McCleave, James David (Dept. of Zool. and Entom., Montana State Coll., Bozeman). 1964. MOVEMENT AND POPULATION OF THE MOTTLED SCULPIN (COTTUS BAIRDI GIRARD) IN A SMALL MONTANA STREAM. Copeia, 1964, No. 3, pp. 506-513.

Movement and population of the mottled sculpin (Cottus bairdi Girard), excluding young of the year, were studied in Trout Creek, Gallatin County, Montana, between August 4, 1962, and March 10, 1963, and in the laboratory between August 7 and December 21, 1962. Fin-clipped fish were recaptured at an average rate of 23.9% (38.1-11.8%) for the 5 censuses. About 50% of the recaptures were within the original section (average length 46.8 ft.), and about 80% were in an original section or an adjacent section (average length 153.2 ft.). Upstream movement of all marked sculpins was 23.4% greater than downstream movement, but downstream movement of jaw-tagged sculpins was 16.6% greater than upstream. No mass upstream migration occurred. Home range was estimated to be less than 150 ft. Homing was not exhibited. About one-third of the displaced sculpins homed, one-third did not move, and one-third moved away from home. The longest upstream movement noted was 590 ft., and the longest downstream was 502 ft. Spatial isolation and aggressive behavior were not observed in a laboratory experiment, which suggests a lack of territoriality during the nonbreeding season. Modified Petersen population estimates ranged from 474-555 sculpins in a 234-ft. section over the 5 inventories, and Schumacher-Eschmeyer estimates ranged from 480-492. (Auth. Abst.)

6996. Kallman, Klaus D. (Genetics Lab., New York Aquarium, New York Zoological Society, New York, N. Y.). 1964. GENETICS OF TISSUE TRANSPLANTATION IN ISOLATED PLATYFISH POPULATIONS. Copeia, 1964, No. 3, pp. 513-522.

Small isolated populations are generally considered to have become homozygous at many gene loci. However, in nearly all cases it is quite difficult to demonstrate experimentally such a decrease in the genetic variability, since suitable genetic markers are usually absent from most species. An attempt has been made to determine by means of tissue transplantation whether small populations are "naturally" inbred. Since the genetic requirements for graft survival are very stringent and since many genes are involved in determining the fate of a graft, the survival of a transplant can be taken as an excellent indication that host and donor possess similar, if not identical, genotypes. Fin transplants were exchanged among the offspring (intrasib grafts) of 15 wild-caught platyfish, Xiphophorus couchianus, collected in 8 different springs or pools. A high percentage (25-69) of the grafts were accepted permanently among sibs whose parents had been collected in springs where the adult population numbered only a few dozen or less. The percentage of successful intrasib grafts declined sharply when the parents came from large populations. (Auth.)

6997. Fitch, John E. (California State Fish. Lab., Terminal Island, California). 1964. SEBASTODES PHILLIPSI, A NEW SCORPAENID FISH FROM CALIFORNIAN WATERS. Copeia, 1964, No. 3, pp. 525-529.

A new Californian rockfish of the family Scorpaenidae is described as Sebastodes phillipsi. This little rockfish is found from Monterey Bay south to Santa Catalina Island, usually in water deeper than 800 ft. (243 m). Because of its habit of changing color when boated, it is given the common name of "chameleon rockfish." (Auth.)

6998. Gilbert, Perry W., and Mark E. Oren (Dept. Zool., Cornell Univ., Ithaca, New York). 1964. THE SELACHIAN NICTITANS AND SUBOCULAR FOLD. Copeia, 1964, No. 3, pp. 534-535.

The term "subocular fold" is synonymous with lower eyelid and should either be dropped or restricted in meaning to indicate a poorly developed lower eyelid which fails to overlap and conceal the retracted nicitans. (Auth.)

6999. Engel, David W., and Edna M. Davis (U. S. Bur. Comm. Fish., Radiobiol. Lab., Beaufort, North Carolina). 1964. RELATIONSHIP BETWEEN ACTIVITY AND BLOOD COMPOSITION IN CERTAIN MARINE TELEOSTS. Copeia, 1964, No. 3, pp. 586-587.

Results of this study suggest a relationship between certain blood characteristics of fish and their respective ecological niche.

7000. Ueda, Tadao, Yutaka Shimizu, and Wataru Simidu (Dept. of Fish., Kyoto Univ., Maizuru, Japan). 1964. STUDIES ON MUSCLE OF AQUATIC ANIMALS. XXXXII. SPECIES DIFFERENCE IN FISH ACTOMYOSIN (PART 2) RELATION BETWEEN HEAT-DENATURING POINT AND SPECIES. Bulletin of the Japanese Society of Scientific Fisheries, Vol. 30, No. 4, pp. 352-356.

The behavior of heat-denatured actomyosin purified from several species of fishes was investigated by means of viscosity measurement and the results were compared among different species. They are summarized as follows: (1) The decrease in the intrinsic viscosity caused by the heat denaturation considerably differs from species to species. That is, when heated for 30 min. the shotted halibut actomyosin shows the drop in viscosity at 25° C, the Japanese mackerel at 30° C, and the swordfish at 35° C. (2) The denaturing temperature of fish actomyosin may have a relation to the temperature in which the fish lives. (Auth. Summ.)

7001. Ikeda, Shizunori, and Mamoru Sato (The Research Inst. for Food Science, Kyoto Univ., Japan). 1964. BIOCHEMICAL STUDIES ON L-ASCORBIC ACID IN AQUATIC ANIMALS. III.

BIOSYNTHESIS OF L-ASCORBIC ACID BY CARP. Bulletin of the Japanese Society of Scientific Fisheries, Vol. 30, No. 4, pp. 365-369.

In a previous paper it was reported that ascorbic acid occurs in all fish tissues, and that its concentration in different tissues of a given fish varies over a wide range. In the present study, ascorbic acid synthesis by carp has been investigated by means of radioactive tracer techniques. The results obtained are as follows:

After injection of D-glucose-1-C^{14} or D-glucuronolactone-6-C^{14} into carp, the specific activities of the visceral ascorbic acid were determined. From the data it is evident that carp are able to synthesize ascorbic acid from such precursors as D-glucose and D-glucuronolactone. Although the administration of Chloretone stimulated the ascorbic acid synthesis in carp from D-glucose, excretion of ascorbic acid was not detected.

The ascorbic acid recovered from the carp administered with the labeled sugars was degraded to determine the activities of the constituent carbon atoms. The results show that D-glucose-1-C^{14} was converted to ascorbic acid labeled primarily in carbon 6, while D-glucuronolactone-6-C^{14} was converted to ascorbic acid labeled predominately in carbon 1. Therefore, it appears that carp possess the same mechanism of ascorbic acid formation as have been found in rats.

Both the ascorbic acid contained in intact fish tissues and the ascorbic acid labeled with C^{14} were identified to be L-form by paper chromatography. (Authors)

7002. Okutani, Koichi, and Masao Kimata (Dept. of Fish., Fac. of Agric., Univ. of Kyoto, Maisuru, Japan). 1964. STUDIES ON CHITINOLYTIC ENZYME PRESENT IN AQUATIC ANIMALS. II. THE CHITINOLYTIC ENZYME PRESENT IN THE LIVER OF JAPANESE SEA BASS, LATEOLABRAX JAPONICUS. Bulletin of the Japanese Society of Scientific Fisheries, Vol. 30, No. 6, pp. 490-494.

In the previous paper, it was reported that the chitinolytic enzyme was present in the stomach of Japanese sea bass, Lateolabrax japonicus, and suggested that the enzyme was inherent in the fish itself.

The present study was carried out in order to ascertain whether the chitinolytic enzyme was present in the liver or not. In order to determine the chitinolytic system, water extracts of the liver were incubated with a chitin suspension, then chitobiose and N-acetylamino sugar liberated were determined. The amount of N-acetylamino sugar was measured by the method as described by Reissig, et al. Chitobiose was estimated from the amount of N-acetylamino sugar produced by the addition of β-glucosidase.

Results obtained are as follows: (1) The chitinolytic enzyme is present in the liver of Japanese sea bass. (2) Substances which are formed by the action of the chitinolytic enzyme may be N-acetylglucosamine and N, N'-diacetylchitobiose, and the enzyme may consist of chitnase and chitobiase. (3) The optimum pH value of chitinase action is about 4 and the optimum temperature is at 40-50° C. The optimum pH value of chitobiase is also about 4. (Authors)

7003. Enomoto, Noriyuki, Hiroki Nakagawa, and Yukio Tomiyasu (Lab. Fish. Chem., Fac. Agric., Kyushu Univ., Fukuoka, Japan). 1964. STUDIES ON THE EXTERNAL MUCOUS SUBSTANCE OF FISHES. IX. PREPARATION OF CRYSTALLINE N-ACETYLNEURAMINIC ACID FROM THE EXTERNAL MUCOUS SUBSTANCE OF LOACH. Bulletin of the Japanese Society of Scientific Fisheries, Vol. 30, No. 6, pp. 495-499.

No detailed work has been done on positive substances for p-dimethylaminobenzaldehyde (the so-called "direct EHRLICH reaction") and orcinol (BIAL's reagent) etc. in the external mucous substance of fish, though there have been a few reports describing the presence and the amount of them. In order to clarify the chemical properties of these substances, the authors studied the external mucous substance of loach.

Crystallization was performed from water-methanol to which ethyl ether was added. The dry material was dissolved in a small amount of water and then methanol 10 times as much as the water was added to it. Ethyl ether was added in small portions during several days. The occurring amorphous precipitate was filtered off. When the amorphous precipitate disappeared, ethyl ether was added until a faint turbidity appeared. The slender needle-like crystal was obtained by standing the turbid solution at room temperature.

Judging from the results, i.e. decomposition point (176-179° C), 5 kinds of absorption spectra, paper chromatogram and infrared spectrum, the crystal was identified as N-acetylneuraminic acid. (Authors)

7004. Stefánsson, Unnsteinn, and Francis A. Richards (Dept. Oceanog., Univ. of Washington, Seattle). 1964. DISTRIBUTIONS OF DISSOLVED OXYGEN, DENSITY, AND NUTRIENTS OFF THE WASHINGTON AND OREGON COASTS. Deep-Sea Research, Vol. 11, No. 3, pp. 355-380.

The distributions of dissolved oxygen, density, and nutrients off the Washington and Oregon coasts are complicated by upwelling, entrainment of deep water, the presence of Columbia River water, biological activity, in situ temperature changes, and possibly by anomalous surface exchanges associated with wave action.

In much of the area there is a good statistical correlation between the dissolved oxygen and the density, except in the upper layers of the coastal region, where large negative oxygen anomalies were found. These anomalies were used to evaluate changes in the oxygen content resulting from biological activity and mixing associated with upwelling.

An offshore, downward advection of water bearing excesses of oxygen photosynthetically produced in the surface layers near shore, is proposed

to explain an oxygen maximum that occurs subsequent to the oxygen's production and at depths that increase with distance from shore. Seasonal variations in this maximum are explained in terms of the balance between the rates of oxygen addition by photosynthesis and the oxygen flux associated with upwelling during the spring and summer, and diffusional erosion of the maximum during periods of more modest photosynthesis.

Simultaneous observations of oxygen and nutrients can yield useful information regarding the biological activity in the surface waters. A first approximation at evaluating the biological changes in the oxygen can be made by assuming that a linear relationship exists between it and changes in nutrient concentrations. Since the nutrients will not be appreciably exchanged with the atmosphere, departures from this linear relationship are assumed to result from the effect of in situ temperature changes on calculated oxygen solubilities and the escape of oxygen to the atmosphere. In areas of intense photosynthesis these departures are small, suggesting that in such regions oxygen production outstrips the escape rate. Under such conditions a good correlation is also found between the carbon-14 assimilation and the apparent oxygen production. On the other hand, low oxygen concentrations, compared to saturation values, coinciding with low nutrients indicate more modest photosynthesis. (Authors' Abst.)

7005. Pytkowicz, Ricardo (Dept. of Oceanography, Oregon State Univ., Corvallis). 1964. OXYGEN EXCHANGE RATES OFF THE OREGON COAST. Deep-Sea Research, Vol. 11, No. 3, pp. 381-390.

A subsurface oxygen maximum is formed in summer as the water temperature rises, as a result of loss of oxygen above the layer in which the maximum occurs. Rates of oxygen exchange and eddy diffusivities are estimated. The exchange coefficient is of the same order of magnitude as that found by Redfield in the Gulf of Maine. (Auth. Abst.)

7006. Park, Kilho (Dept. of Oceanography, Oregon State Univ., Corvallis). 1964. ELECTROLYTIC CONDUCTANCE OF SEA WATER: EFFECT OF CALCIUM CARBONATE DISSOLUTION. Science, Vol. 146, No. 3640, pp. 56-67.

Calcium carbonate dissolution in the presence of excess carbon dioxide increased the specific conductance of sea water by approximately 6×10^{-5} $ohm^{-1}cm^{-1}$ per millimole of carbonate dissolved. The observed conductance increase can be explained by the partial equivalent conductance of calcium bicarbonate and by the hindrance effect of uncharged carbon dioxide dissolved in sea water. (Auth.)

7007. Carroll, Billy B., and Gordon E. Hall (Tennessee Valley Authority, Norris, Tennessee). 1964. GROWTH OF CATFISHES IN NORRIS RESERVOIR, TENNESSEE. Journal of the Tennessee Academy of Science, Vol. 39, No. 3, pp. 86-91.

Spines from 254 flathead and 87 channel catfish were used to determine growth rates of these two species in Norris Reservoir.

Flathead catfish averaged 5.2 inches in total length at the end of their first year and 9.4, 13.8, 18.6, 23.2, 26.4, 29.0, 31.1, 33.1, 34.6, 37.3, 39.0, 39.7, 39.9, 40.8, and 42.0 inches, respectively, at the ends of succeeding years. Channel catfish averaged 3.9 inches in total length at the end of their first year and 6.9, 10.7, 12.8, 14.7, 16.7, 18.0, and 21.3 inches, respectively, at the ends of succeeding years.

Length-weight relationships show flathead catfish weigh approximately 0.4 pound at 10 inches, or minimum harvestable size, 2.1 pounds at 20 inches, 13.5 pounds at 30 inches, and 25 pounds at 40 inches. Channel catfish weigh approximately 0.3 pound when they reach 10 inches, 1 pound at 15 inches, and 4 pounds at 21 inches.

Some evidence of accelerated growth was found in three- to five-year-old flathead catfish after an extreme water-level drawdown in the winter of 1955-56, but growth of younger fish remained average or below.

Growth acceleration was not evident in older channel catfish but fish of the 1956 year-class were longer at all ages than those of 1954 and 1955.

Little is known about the present catfish harvest in Norris, but it is assumed to be light since there is no commercial fishing and sport catches are largely incidental. From this growth study no regulation appears necessary. (From Auth. Summ.)

7008. Wohlschlag, Donald E. (Stanford University, Standford, California). 1964. RESPIRATORY METABOLISM AND ECOLOGICAL CHARACTERISTICS OF SOME FISHES IN McMURDO SOUND, ANTARCTICA. Biology of the Antarctic Seas, Antarctic Research Series, Vol. 1, pp. 33-62.

Measurements of oxygen-consumption rates of five stenothermal fishes have been related by multiple-regression statistics to body weights, to temperatures above the natural (-1.9°C) temperatures to which laboratory acclimation is possible, and to rate of swimming for three species. The log O_2 consumption, log weight coefficients for the five species tend to be somewhat higher than for more temperate species. Metabolism-temperature coefficients tend to be somewhat higher for the Antarctic fishes. Pelagic Trematomus borchgrevinki is a stronger and metabolically more efficient swimmer than the sedentary, benthic T. lonnbergi and T. hansoni. A level of no excess swimming activity occurs at about +2°C for acclimated fish. The level of energy required for swimming is at least double that for more temperate species.

An evaluation of acclimation times up to five days at each one-degree temperature level revealed that the statistical variability of metabolism for the benthic T. bernacchii was at a minimum for field measurements without acclimation and tended to increase with laboratory acclimation time. For pelagic, plankton-feeding T. borchgrevinki metabolic variability decreased with laboratory acclimation time up to five days. Males of T. bernacchii, T. borchgrevinki, and possibly other species have higher metabolism. Greater seasonal metabolic

fluctuations at nearly constant freezing temperatures occur for T. bernacchii in shallow waters, and the summer fluctuations in deeper waters tend to lag behind those in the shallower waters; however, the two sexes tend to have nonsynchronous fluctuations. T. bernacchii, the first species ever taken beneath permanent glacial ice shelf cover, have low metabolic rates that correspond to those for the same species in deeper parts of McMurdo Sound. At the lowest temperatures metabolic variability tends to be greatest and upward from the overall metabolism-temperature trend, so that at normal freezing temperatures, some of the fishes some of the time would have metabolic levels expected only at much higher temperatures. Metabolic levels of the nototheniids, Trematomus borchgrevinki, T. bernacchii, T. lonnbergi, and T. hansoni are highly cold adapted in decreasing order. A zoarcid, Rhigophila dearborni, is only slightly cold adapted; it can be acclimated to +4° C, several degrees higher than the nototheniids. The slightly less stenothermal status and the less marked cold adaptation of the zoarcid may be related to its systematic affinities among zoarcids, which have a much broader zoogeographic range than nototheniids.

An inclusive graphical comparison of metabolism-temperature ranges from published data on tropical, temperate, and polar species reveals that there is a marked metabolic range attenuation due to cold adaptation and upward displacement of metabolic levels for polar species that are stenothermally adapted to temperatures at or below zero degrees. (Auth. Abst.)

7009. Findenegg, Ingo (Biologischen Station Lunz der Osterreichischen Akademie der Wissenschaften, Wien). 1962. LIMNOLOGISCHE UND FISCHEREI-BIOLOGISCHE UNTERSUCHUNGEN AN EINEM DURCH ABWASSER ALKALISIERTEN ALPENSEE, DEM MILSTÄTTER SEE IN KARNTEN. Zeitschrift für Fischerei und deren Hilfswissenschaften, Band XI, Heft 1/2, pp. 115-127.

The Austrian Millstätter See was alkalized up to pH 9.3 by industrial water pollution within the last 8 years. Nevertheless, no decrease of the planktonic production occurred as it has been supposed by experts. Comparisons of the present standing crop with that of earlier years and with the algal biomass of other alpine lakes, as well as measurements of the C-assimilation by the C^{-14} method, showed that alkalization did not hinder primary production. However, some changes in the qualitative composition of the plankton were observed. During the period of raised alkalinity the yield of lake-trout and pike was diminishing, that of char and tench increasing, and the "Weis" (Silurus glanis) remained unaltered. (Auth.)

7010. Müller, Wolfgang, and Günter Merla. 1962. VERSUCHE ZUR STEIGERUNG DER ERTRÄGE BEI SATZ- UND SPEISEKARPFEN DURCH BESATZ- UND FÜTTERUNGSMASSNAHMEN. Zeitschrift für Fischerei und deren Hilfswissenschaften, Band XI, Heft 1/2, pp. 1-46.

In order to increase the production of carp, 2-factorial experiments with the density of fish and the quantity of food have been made in two phases, each arranged as Fisher-blocks.

In 1959 the increase of the density from about 400 to about 650-700 K_{2-3}/ha was more successful than the increase of food from 752 to 1300 kg of barley/ha. In 1960 the increase of food from 1338 kg to more than 2000 kg of wheat was more successful than the increase of the density from 632 to about 1000 kg K_{2-3}/ha. By useful combination of both factors the yield grew from 531 kg in the beginning to 957 kg/ha. The utilization of cereals was very favorable and the costs, 100 DM of yield value, were only a bit higher.

As to the experiments of increasing the production of fry-carp (K_2) the highest results have been achieved with 5000 K_1/ha and 1500 kg cereals. An influence of a high density of fish on the fauna of the bottom could be stated, contrary to zooplankton. By about 5000 K_{1-2}/ha the maximum of the animals of the profundal has been strongly utilized till the beginning of August. Intensive feeding of cereals gave to the K_2 a high reserve of fat. The loss of fish under unfavorable conditions in winter were low only at moderate intensity of cultivation. (Authors)

7011. Jaszfalusi, Lajos, and Janos Paskandy. 1963. DIE UNTERSUCHUNG DER BIOMETEOROLOGISCHEN BEZIEHUNGEN DES KARPFENLAICHENS. Zeitschrift für Fischerei und deren Hilfswissenschaften, Band XI, Heft 3/4, pp. 189-199.

Physiological and ecological factors cause induction of spawning in carp. The eggs attain a certain maturity stage which corresponds to the fourth point of the Suvorov scale. According to the scale, the last stage presumably is influenced by those spawning inducing ecological factors as, for instance, an appropriate spawning bed and spawning partner and certain atmospheric conditions.

The authors examined, during seven years in the pond farm of Gödöllö, the biometeorological conditions of carp spawning, especially those which induce a general mass spawning of carp. In the seventh year of their examinations data were also collected from other pond farms and various natural waters.

They noted that under Hungarian climatic conditions the general mass spawning of carp usually takes place when there are prefrontal weathers, i. e., when subtropical air masses form a warm front or when subtropical air is retreated by a cold front. This knowledge will be useful for intensive rearing of hatchery carp. In Hungary the transfer of carp in ponds for natural spawning or the spawn-taking occur in the prefrontal period recognizable by a southerly wind direction and dropping atmospheric pressure at the same time.

The time of transfer into spawning ponds is selected when the stimulating, spawning inducing influence of favorable atmospheric conditions can be utilized. In this case, similar results are

attainable as when stimulated with hormones (hypophysis- resp. choriogonine treatment). The influence of meteorological factors upon the hypophysis and the central nervous system of carp explains the physiological side of this problem (front sensibility). The mechanical action of this process is presumably connected with high frequency radiation occurring amidst frontal thunderstorms. Additional research is necessary to resolve this assumption. (Authors)

7012. Mathisen, Ole A., Robert L. Burgner, and Ted S. Y. Koo (Fish. Res. Inst., Coll. of Fish., Univ. of Washington, Seattle). 1963. STATISTICAL RECORDS AND COMPUTATIONS ON RED SALMON (ONCORHYNCHUS NERKA) RUNS IN THE NUSHAGAK DISTRICT, BRISTOL BAY, ALASKA, 1946-59. U. S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 468, 32 pp.

This paper presents the basic biological statistics collected from the catch and escapement of red salmon runs in the Nushagak District of Bristol Bay, Alaska, for the years 1946-59. Tables of preliminary computations showing relationships between the adult escapement and the returning run and between the seaward migration of juveniles and the returning run are also given.

7013. Clark, Clarence F. (Ohio Div. of Wildlife, 1500 Dublin Road, Columbus, Ohio). 1964. BLUEGILL CONTROL EXPERIMENT IN HAMLER LAKE, OHIO. Ohio Dept. of Natural Resources, Publication W-335, 5 pp.

The stocking of one yearling bass to one yearling bluegill in a three and one-half acre rehabilitated pond in the spring of 1950 resulted in rapid growth and reproduction by the bluegills, and rapid growth and no reproduction by the bass. An attempt to fill this void was made by stocking fingerling bass in the fall of 1951 to provide similar age groups of both species. Annual shore seining from 1951 through 1954 revealed an overbalanced population dominated by small bluegills. In each year the bass population was bolstered by the addition of from 250 to 664.5 fingerlings per acre, of two to eight inches in length, with no noticeable control of the bluegill population.

When a fish loss took place in the pond following chemical vegetation control, the population was similar in species to that found in 1950, except that it included greater numbers of larger predators. (Auth. Abst.)

7014. Deelder, C. L., and J. Willemsen (Netherlands Institute for Fishery Investigations, Ijmuiden, Netherlands). 1964. SYNOPSIS OF BIOLOGICAL DATA ON PIKE-PERCH, LUCIOPERCA LUCIOPERCA (LINNAEUS) 1758. Food and Agric. Org. of the United Nations, FAO Fisheries Synopsis No. 28, 52 pp.

This is one of a series of documents issued by FAO and CSIRO concerning species and stocks of aquatic organisms of present or potential economic interest. The contents includes identity, distribution, bionomics and life history, populations, exploitation and an extensive list of references.

7015. Jankovic, Draga (Biol. Inst., Belgrade, Yugoslavia). 1964. SYNOPSIS OF BIOLOGICAL DATA ON EUROPEAN GRAYLING, THYMALLUS THYMALLUS (LINNAEUS) 1758. Food and Agric. Org. of the United Nations, FAO Fisheries Synopsis No. 24, 45 pp.

This synopsis covers the identity, distribution, bionomics and life history, population, and exploitation of the European grayling. A list of references is included.

7016. Griswold, Bernard L. (Dept. Zool. & Ent., Iowa State Univ. of Science & Technology, Ames). 1963. FOOD AND GROWTH OF SPOTTAIL SHINERS AND OTHER FORAGE FISHES OF CLEAR LAKE, IOWA. Proceedings of Iowa Academy of Science, Vol. 70, pp. 215-223.

Collections of spottail shiners, Notropis hudsonius, and other forage fishes were made by systematic seining in Clear Lake in 1961. Spottails made up 71.6 percent of all forage species and were collected most frequently in areas of vegetation. Although most spawning occurred in late May and early June, a few spottails apparently spawned in August. Young spottails grew an average of 0.05 millimeters per day which is slower than in warmer years. No parasites of spottails were observed.

Tadpole madtoms, Noturus gyrinus, made up 18.4 percent of all forage species collected, higher than any previous year. All species studied fed primarily on Cladocera and vegetable material until midsummer when insect material became abundant. After this, insects made up the major part of the diet. (Auth. Abst.)

7017. Caillouet, Charles W., Jr. (Dept. of Zool. and Ent., Iowa State Univ. of Science & Technology, Ames). 1964. BLOOD LACTIC ACID CONCENTRATION OF UNEXERCISED AND EXERCISED MATURE CARP IN WINTER AND SUMMER. Iowa State Journal of Science, Vol. 38, No. 3, pp. 309-322.

Blood lactic acid concentrations of mature carp in the unexercised condition and during 16 hours after 15 minutes of forced exercise were determined in winter, February-March, 1961 (1° C) and in summer, July, 1961 (24° C). In February-March, the mean blood lactic acid concentration increased, from an unexercised value of 9 mg/100 ml of whole blood (mg %) approximately twofold to a value of 22 mg % immediately after forced exercise. This higher level was maintained for at least 2.5 hours after exercise then returned to the unexercised level by 4.4 hours after exercise. No difference in mean blood lactic acid concentration was detected between male and female fish. In July, variability in blood lactic acid among individual fish was greater than in February-March, and no significant differences in mean blood lactic acid values were detected among unexercised and exercised groups or between sexes. The highest individual blood lactic acid levels were observed in July. These results may have represented an effect of higher temperature, but may also

have been the result of an insufficient holding period prior to the experiment and a greater variability in voluntary (nonexperimental) and/or experimental activity among individual fish. In both studies, variability in blood lactic acid concentration among individual fish increased with increase in the mean. Because the standard deviation was approximately proportional to the mean, a logarithmic transformation was used. (Auth.)

7018. Vanicek, C. David (Dept. of Zool. and Ent., Iowa State Univ. of Science and Technology, Ames). 1964. AGE AND GROWTH OF SAUGER, STIZOSTEDION CANADENSE (SMITH), IN LEWIS AND CLARK LAKE. Iowa State Journal of Science, Vol. 38, No. 4, pp. 481-502.

The sauger, Stizostedion canadense (Smith), is an important game fish in Lewis and Clark Lake and the Missouri River up to Fort Randall Dam. Experimental gill nets, frame nets, beach seines, a trawl, and an electric shocker were used to capture 953 sauger from May through October 1962. The average condition factors were 29.3 for reservoir sauger and 27.9 for river sauger. Condition factors increased with length but showed no seasonal trend or sex differences. Both reservoir and river sauger increase in weight significantly faster than the cube of their length. Analysis of covariance indicated a significant difference between the two length-weight regression lines. Gizzard shad, Dorosoma cepedianum, were the predominant food of saugers.

Age and growth were determined from the scales of 531 sauger. The largest growth increment was attained during the first year of life, and no fish over age VI was taken. Multiple regression analysis indicated different growth responses for males and females, but the trends were not consistent. Growth was faster in the reservoir than in the river. The year 1962 was definitely a better-than-average year for growth of age 0 sauger. The year in which the reservoir was first filled, 1956, produced a particularly abundant year-class. Growth of sauger in Lewis and Clark Lake is generally more rapid than in other waters which have been studied. Female sauger are significantly more abudant than male sauger in later years of life. (Auth. Abst.)

7019. Seifert, Melvin F. (996 Pammei Court, Ames, Iowa). 1963. SOME ASPECTS OF TERRITORIAL BEHAVIOR OF THE FANTAIL DARTER. Proceedings of the Iowa Academy of Science, Vol. 70, pp. 224-227.

Striped fantail darters, Etheostoma flabellare lineolatum, were maintained in small aerated aquaria and fed tubificid worms. Darters over 1 inch long established and defended territories usually no larger than a nook under rocks. Darters, over 2 inches long, selected covers open on both sides, but medium-sized darters selected smaller, more secluded covers. Dominance in selection of territory was associated with size, although established darters might maintain their covers against larger newcomers. Stone bottom was selected over pebble and pebble over sand. Pigmentation seemed to show an effect in habitat selection. (Auth. Abst.)

7020. Kraus, Rudy (Loras Coll., Dubuque, Iowa). 1963. FOOD HABITS OF THE YELLOW BASS, ROCCUS MISSISSIPPIENSIS, CLEAR LAKE, IOWA, SUMMER 1962. Proceedings of Iowa Academy of Science, Vol. 70, pp. 209-215.

Return of Clear Lake water levels to normal was accompanied by some increase in growth of yellow bass in 1962. Entomostracans, chironomids and Hyalella sp. were the principal foods of young yellow bass. Immature insects, principally Diptera, were the predominant foods of older bass with cladocera, Hyalella sp. and copepods next in importance. There was no increase in utilization of small fish as food. Yellow bass were more active and fed more at night than in daytime. (Auth. Abst.)

7021. Karr, James R. (621 Pammel Court, Ames, Iowa). 1963. AGE, GROWTH, AND FOOD HABITS OF JOHNNY, SLENDERHEAD AND BLACKSIDED DARTERS OF BOONE COUNTY, IOWA. Proceedings of Iowa Academy of Science, Vol. 70, pp. 228-236.

Age, growth, and food habit studies were done on 61 johnny darters, Etheostoma nigrum, 25 slenderhead darters, Percina phoxocephala, and 18 blacksided darters, P. maculata, taken from the Des Moines River, Boone County, Iowa, during the summer 1962. The growth rate of blacksided darter is faster than either of the other two species. Coefficients of condition, length-weight relationships, and body-scale relationships are similar for the three species. The food of all species is over 90% insect. Leeches and tapeworms parasitized the darters. (Auth. Abst.)

7022. Robson, D. S., and H. A. Regier (Biometrics Unit, Cornell Univ., Ithaca, New York). 1964. SAMPLE SIZE IN PETERSEN MARK-RECAPTURE EXPERIMENTS. Transactions of the American Fisheries Society, Vol. 93, No. 3, pp. 215-226.

The efficient planning of a Petersen-type mark and recapture experiment requires some knowledge of the order of magnitude of the population size N. Sample sizes M and C of the mark and recapture samples, respectively, may then be ascertained on the basis of a guessed value of N to achieve any desired degree of accuracy with any specified degree of confidence. Restrictions on the sample sizes M and C are that MC must exceed 4 times the guessed value of N, and the total costs of M and C must be equal. Graphs and formulas are given defining sample size to attain preassigned levels of accuracy and precision of population estimation. A method of choosing sample sizes such that experimental costs are minimized is described. (Authors' Abst.)

7023. Davis, William Spencer (Bur. Comm. Fish., U. S. Fish and Wildlife Service, Seattle, Wash.). 1964. GRAPHIC REPRESENTATION OF CONFIDENCE INTERVALS FOR PETERSEN POPULATION

ESTIMATES. Transactions of the American Fisheries Society, Vol. 93, No. 3, pp. 227-232.

Probable confidence intervals for Petersen population estimates play an important part in decisions concerning the number of animals that must be marked and the size of the catch from which recaptures must be obtained. Requirements for an acceptable confidence interval may be so difficult to satisfy as to make a study impractical, even though the confidence interval itself is based only upon magnitude of numbers and not upon their accuracy. Graphs of the changes in confidence intervals from large to small as the magnitudes of marks applied, marks recovered, and catch change from small to large are presented to give perspective for the planning and development of Petersen population estimates. Confidence intervals were estimated by use of published formulas, tables, and graphs. (Auth. Abst.)

7024. Houser, Alfred (South Central Reservoir Investigations, Bur. Sport Fisheries and Wildlife, Fayetteville, Arkansas), and Arthur W. Ghent. 1964. AN EXPERIMENTAL GILL NET BASED ON THE PRINCIPLE OF THE LATIN SQUARE. Transactions of the American Fisheries Society, Vol. 93, No. 3, pp. 233-242.

The inadequacies of population studies based on captures from gill nets have been apparent to fishery biologists for many years. In an effort to overcome some of their deficiencies, we have incorporated the latin-square principle in a new net. Tests reveal that the quality of the sample compares favorably with that of conventional gill nets, although the latin-square net appears to catch slightly fewer fish per unit of area. However, the distributive positioning of mesh sizes provides a more representative sample than any single standard net. In addition, representative samples may be obtained with smaller nets. Its application to ecological studies, including both lateral and depth distribution as well as to associative groupings, allows for much more definitive interpretations of fish behavior. Although the labor of constructing a latin-square net by hand methods is substantial, the increased efficiency in population sampling, especially in small bodies of water is an adequate compensation. (Authors)

7025. Cramer, Frederick K., and Raymond C. Oligher (U. S. Army Corps of Engineers, Walla Walla, Washington). 1964. PASSING FISH THROUGH HYDRAULIC TURBINES. Transactions of the American Fisheries Society, Vol. 93, No. 3, pp. 243-259.

Beginning in 1959, the Walla Walla District, U. S. Army Corps of Engineers, under auspices of the Corps of Engineers' Fisheries Engineering Research Program, has conducted extensive tests on downstream passage of fish through hydraulic turbines, utilizing both model and prototype installations. Purposes of the tests were (1) to establish design criteria for high-head Francis-type turbines that will provide optimum fish passage, and (2) to establish the best method of operating existing Kaplan- and Francis-type turbines that will provide maximum survival of fish under prevailing conditions.

Tests at Allis-Chalmers' Hydraulic Laboratory, York, Pennsylvania, using 12-inch-diameter model turbines, demonstrated that mortality among fish passing through a model was of appropriate magnitude to allow comparative studies of mortality in various model installations, that mortality was greatly influenced by turbine operating conditions (efficiency) and relationship of tailwater elevation to runner setting, and that increased clearances in the water passageways reduced mortality if turbine efficiency could be maintained. Prototype tests at Cushman No. 2 hydroelectric plant, Skokomish River, Washington, and Shasta hydroelectric plant on Sacramento River, California, verified model findings, with survival rates ranging from 45 to 77 percent at Cushman and reaching 91 percent in some instances at Shasta, depending upon turbine operating conditions and tailwater levels. These studies have given hope that through proper design, setting, and operation, successful fish passage through high-head turbines can be achieved. (Authors)

7026. Ryder, R. A. (Ontario Dept. of Lands and Forests, Research Br., Maple, Ontario, Canada). 1964. CHEMICAL CHARACTERISTICS OF ONTARIO LAKES AS RELATED TO GLACIAL HISTORY. Transactions of the American Fisheries Society, Vol. 93, No. 3, pp. 260-268.

Concentrations of total dissolved solids and total alkalinity of 310 Ontario waters varied according to the glacial history of the region. Concentrations were lowest in waters in Precambrian Shield Region, moderately high in the Region of Extinct Pleistocene Lakes, and highest in the Region of Past Marine Submergence. Concentrations also varied seasonally and spatially within a lake or watershed. A positive relationship was found between total dissolved solids and total alkalinity. (Auth. Abst.)

7027. Seaburg, Keith G. (South Dakota Dept. Game, Fish and Parks, Webster), and John B. Moyle. 1964. FEEDING HABITS, DIGESTIVE RATES, AND GROWTH OF SOME MINNESOTA WARM-WATER FISHES. Transactions of the American Fisheries Society, Vol. 93, No. 3, pp. 269-285.

Quality and quantity of food ingested, summer feeding habits, and digestion rates are reported for eight species of fish from two western Minnesota lakes, one of which had a dense population of centrarchid panfishes and the other, a smaller population. Both lakes also had game and forage fishes. Most complete data are presented for bluegill (Lepomis macrochirus), pumpkinseed (Lepomis gibbosus), black crappie (Pomoxis nigromaculatus), and northern pike (Esox lucius) and some for walleye (Stizostedion vitreum), largemouth bass (Micropterus salmoides), black bullhead (Ictalurus melas), and yellow perch (Perca flavescens).

Fish were taken by seining from weedy littoral areas and stomach contents removed with a stomach pump. Quality and quantity of stomach contents are

related to kinds and sizes of fish, growth, population density, and inter- and intraspecific competition.

Greatest volumes of food were found in the stomachs in early summer and least in late summer. The three centrarchid panfishes fed mostly on insects in early summer but as summer progressed bluegills ingested more plant material, pumpkinseeds more snails, and crappies more fish. Crustaceans were important only in early and late summer and were most important for small fish. Average amounts of food in the panfish stomachs were usually less, and growth was slower in the denser population. Centrarchid panfishes had fewer empty stomachs (6.4 percent) than the gamefishes (40.7 percent), suggesting a more regular feeding pattern. Bluegills fed fairly regularly throughout the day. Northern pike, walleyes, and bass fed mostly on perch even when minnows and small centrarchid panfishes were common. However, the crappie diet included small centrarchids as did that of bluegills from the denser populations.

Digestive rates were faster for centrarchid panfishes than for the larger game fishes. At water temperatures mostly between 64 and 74° F the panfishes digested about 50 percent of stomach volumes in 5 hours, 75 percent in 12 hours, and 100 percent, or nearly, in about 21 hours. Animal foods were digested more rapidly than plant materials and digestive rates for the same kinds of foods were similar for different sizes of panfishes. Northern pike required about 20 hours for 50 percent reduction of stomach contents and 50 hours for 100 percent. Digestive rates for walleyes and bass were intermediate between pike and centrarchid panfishes.

The average daily ration for the summer for the centrarchid panfishes was usually between 1 and 2 percent of the body weight per day. It was least in dense populations, and less for larger than for smaller fish of the same species. The daily ration appears to be related to both inter- and intraspecific competition for food. It is reflected in growth rates and probably influences maximum size. (Authors)

7028. Larkins, Herbert A. (Bur. Comm. Fish., U. S. Fish and Wildlife Serv., Seattle, Washington). 1964. SOME EPIPELAGIC FISHES OF THE NORTH PACIFIC OCEAN, BERING SEA, AND GULF OF ALASKA. Transactions of the American Fisheries Society, Vol. 93, No. 3, pp. 286-290.

In the course of salmon gill netting operations in the North Pacific Ocean, Bering Sea, and Gulf of Alaska over a 7-year period, 37 species of fishes other than salmon have been captured incidentally. The catches of such species are listed by area and their relative abundance is calculated. Compared to salmon in the same localities, the incidental species are taken in small numbers and over limited ranges.

Three species have heretofore been considered quite rare, another has been seen previously only in the South Pacific, and one may represent a new species. Several fishes show seasonal variations in distribution, possibly related to a preference for warmer water. (Auth. Abst.)

7029. Shomura, Richard S. (Bur. Comm. Fish., Biol. Lab., Honolulu, Hawaii). 1964. EFFECTIVENESS OF TILAPIA AS LIVE BAIT FOR SKIPJACK TUNA FISHING. Transactions of the American Fisheries Society, Vol. 93, No. 3, pp. 291-294.

In Hawaii Tilapia mossambica is reared as live bait to supplement the chronically short supply of the native bait fish, the nehu (Stolephorus purpureus). Effectiveness of tilapia and nehu as bait for skipjack tuna (Euthynnus pelamis) was compared in the course of fishing experiments carried out in 1962 in Hawaiian waters. For all sizes of skipjack, slightly more schools responded positively to nehu than to tilapia. Nehu produced higher catch rates (fish caught per minute), and this superiority was more pronounced with large skipjack than with small ones. Since the shortage of bait fish for the Hawaiian skipjack fishery remains critical, further work should be done to develop techniques for using tilapia as bait and to determine whether the availability and hardiness of tilapia can compensate for their inferior effectiveness as bait. (Auth. Abst.)

7030. McErlean, Andrew J., and C. Lavett Smith (Nat. Res. Ins., Hallowing Point Station, Prince Frederick, Maryland). 1964. THE AGE OF SEXUAL SUCCESSION IN THE PROTOGYNOUS HERMAPHRODITE MYCTEROPERCA MICROLEPIS. Transactions of the American Fisheries Society, Vol. 93, No. 3, pp. 301-302.

Investigations of the gag, Mycteroperca microlepis (Goode and Bean), indicate that in this species the entire gonad transforms from an ovary to a testes. Field and histological examination of the gonads were correlated with age as determined from otoliths. The data suggested that gags mature as females during the fifth or sixth year and transform to males during their tenth or eleventh year.

7031. Isaacson, Peter A. (Marine Resources Operations, California Department of Fish and Game, Terminal Island). 1964. LENGTH-WEIGHT RELATIONSHIP OF THE WHITE CROAKER. Transactions of the American Fisheries Society, Vol. 93, No. 3, pp. 302-303.

Logarithmic forms of equations to fit the standard length-weight relationship and the total length-weight relationship are presented.

7032. Houde, Edward D. (Dept. Cons., Cornell Univ., Ithaca, New York). 1964. THE STRIGEID TREMATODE, CRASSIPHIALA BULBOGLOSSA, FROM THE BLACKNOSE DACE, RHINICHTHYS ATRATULUS. Transactions of the American Fisheries Society, Vol. 93, No. 3, pp. 304-306.

Crassiphiala bulboglossa is identified as the causative agent for black spot infestation in Rhinichthys atratulus and R. cataractae.

7033. Westgard, Richard L. (State Dept. of Fish., Hatchery Pathology Lab., Univ. of Washington,

Seattle). 1964. PHYSICAL AND BIOLOGICAL ASPECTS OF GAS-BUBBLE DISEASE IN IMPOUNDED ADULT CHINOOK SALMON AT McNARY SPAWNING CHANNEL. Transactions of the American Fisheries Society, Vol. 93, No. 3, pp. 306-309.

Described are the causes, results and possible solutions for gas-bubble disease in adult chinook salmon caused by nitrogen supersaturated water supplies at the McNary spawning channel.

7034. Choate, Jerry (Dept. Cons., Cornell Univ., Ithaca, New York). 1964. USE OF TETRACYCLINE DRUGS TO MARK ADVANCED FRY AND FINGERLING BROOK TROUT (SALVELINUS FONTINALIS). Transactions of the American Fisheries Society, Vol. 93, No. 3, pp. 309-311.

An experiment is described which provides preliminary data on dosage levels and short-term longevity of the mark in brook trout fed with tetracycline additives in the initial weeks of feeding. Laboratory tests indicate that usable marks can be produced on fingerlings that have just started to feed. Field limitations are discussed.

7035. Waters, Thomas F. (Dept. Ent., Fish., and Wildl., Univ. of Minnesota, St. Paul). 1964. RECOLONIZATION OF DENUDED STREAM BOTTOM AREAS BY DRIFT. Transactions of the American Fisheries Society, Vol. 93, No. 3, pp. 311-315.

The downstream drifting of some stream invertebrates is a mechanism fully sufficient to return disturbed populations to normal or capacity levels in a short time. In the present case of dominant organisms exhibiting high drift rates, such as Baetis and Gammarus, bottom populations were returned to normal conditions in a day or two, at least during summer months when drift rates were high. However, the failure of an abundant organism to recolonize quickly may permit another organism to recolonize to above original levels. It appears that a drift of about 0.4 gram would result in the return of Baetis to normal population density; thus, at the lowest daily drift rates observed (0.04 gram per day), a 10-day interval would be sufficient. In the case of Gammarus, 100 percent recolonization occurred after a drift of about 7 grams; with the lowest drift rates of about 0.5 gram per day, a 14-day interval would be sufficient for a return to normal densities. It is likely that the sum of successive days with low drift would result in greater recolonization than 1 day with an equivalent high drift, because the lower drift rates are more efficient in effecting recolonization.

7036. Lewis, William M., and Don R. Helms (Fish. Res. Lab. and Dept. Zool., Southern Illinois Univ., Carbondale). 1964. VULNERABILITY OF FORAGE ORGANISMS TO LARGEMOUTH BASS. Transactions of the American Fisheries Society, Vol. 93, No. 3, pp. 315-318.

The utilization of different forage organisms by the largemouth bass and smallmouth bass was observed under pond conditions with available forage controlled. In the largemouth bass trials where individual forage species were introduced, the fingerling bluegill was used less than any other forage organism. Small tadpoles were most heavily utilized. Where two forage species were offered in combination, the largemouth bass utilized the green sunfish, black bullhead, tadpole, and crayfish to a greater extent than the bluegill. When six different forage organisms were available to the bass, the black bullhead and crayfish were utilized to a greater extent than were the green sunfish and tilapia, while the golden shiner and bluegill were not utilized. Similar results were obtained with the smallmouth bass.

7037. Swingle, Wayne E. (Agricultural Experiment Sta., Auburn Univ., Auburn, Alabama). 1964. LENGTH-WEIGHT RELATIONSHIPS I, IBM 1620, FORTRAN/FORMAT. Transactions of the American Fisheries Society, Vol. 93, No. 3, pp. 318-319.

Described is a program which computes the standard length-weight equation $W = aL^b$ and also a third-degree polynomial equation $W = b_1 + b_2L + b_3L^2 + b_4L^3$ by least-squares procedures as outlined by Hader and Grandage (1958).

7038. Swingle, Wayne E. (Agricultural Experiment Sta., Auburn Univ., Auburn, Alabama). 1964. LENGTH-WEIGHT RELATIONSHIPS II, IBM 1620, FORTRAN/FORMAT. Transactions of the American Fisheries Society, Vol. 93, No. 3, p. 319.

A program which computed average empirical weight, maximum and minimum weights, condition index, and number of fish for each interval is described.

7039. Warlen, Stanley M. (Thesis, University of Delaware, Newark). 1963. SOME ASPECTS OF THE LIFE HISTORY OF CYPRINODON VARIEGATUS LACÉPÈDE 1803, IN SOUTHERN DELAWARE. Univ. Delaware, 40 pp.

During the period May 12, 1962, to December 20, 1962, 5740 specimens of Cyprinodon variegatus were collected in the shore zones of Rehoboth and Indian River Bays of southern Delaware. The findings from a study of these collections serve as a basis for this paper in terms of the distribution of the species in the study area, age and growth patterns, reproduction and spawning, and food and feeding habits.

C. variegatus seems to be a permanent resident of the shallow brackish waters (0-5.0 ft.) of southern Delaware occurring in salinities which varied from 14.25 to 31.27 0/00 and water temperatures of 2-33°C.

Length-frequency distributions were used for the age and growth study since the use of fish scales did not prove feasible. The growth rate was rapid after hatching in May, being 2.4 mm per week but decreased to 0.5 mm per week in September. Fish hatched in May may have reached a standard length of 27-30 mm by September of the same year. Maximum standard length for females was 49 mm with a weight of 7.9 grams and for males 51 mm with a weight of 7.3 grams. Maximum age was probably

three years.

The spawning season in C. variegatus was quite extended, lasting from May to August as evidenced by an examination of ovaries of the sheepshead minnow. Sexual maturity was attained in males at a standard length of 24-25 mm and in females at 27-28 mm. Females outnumbered males in all but two collections with an average sex ratio of 1.32 females to 1.00 males. Spawning was not observed but it was noticed that males did exhibit territorialism.

Analysis of intestinal contents showed that C. variegatus had a varied diet and that plant material, such as diatoms, algae, and possibly portions of Spartina, was the most important food. The only seasonal change in diet was the presence of copepods in the intestines during May and their absence thereafter. Fish of all sizes fed generally upon the same items. (Auth. Summ.)

7040. Peters, John C. (Montana Fish and Game Dept., Billings). 1962. THE EFFECTS OF STREAM SEDIMENTATION ON TROUT EMBRYO SURVIVAL. Federal Aid Dingell-Johnson Project F-20-R, Montana. Presented at Third Seminar on Biological Problems in Water Pollution at Cincinnati, Ohio.

Five sampling stations were established in Bluewater Creek to measure sediment concentrations and discharge. In the vicinity of the sediment-discharge stations, man-made redds were constructed with sorted gravel. Eyed rainbow trout eggs in hatching boxes were placed in the redds. Periodically, the Mark VI standpipe apparatus was used to measure intragravel dissolved oxygen and intragravel apparent velocity within the redds. The sampling stations with low sediment concentrations responded with high intragravel dissolved oxygen rates, high intragravel apparent velocities (seepage rates), and low trout embryo mortality. Conversely, the sampling stations with high sediment concentrations responded with low intragravel dissolved oxygen rates, low intragravel apparent velocities (seepage rates), and high trout embryo mortality. (Auth.)

7041. Izhevskii, G. K. 1961. OCEANOLOGICAL PRINCIPLES AS RELATED TO THE FISHERY PRODUCTIVITY OF THE SEAS. (OKEANOLOGICHESKIE OSNOVY FORMIROVANIYA PROMYSLOVOI PRODUKTIVNOSTI MOREI.) Avail.: Office of Technical Services, U. S. Dept. Commerce, Washington 25, D. C., OTS 63-11120, 186 pp., $2.00.

This book is concerned with the fundamental biological problem of the relationships existing between organic and inorganic nature.

The author has carried out an extensive analysis of physical and biological marine processes as they mutually influence one another. The study surveys the physical marine conditions and established the patterns governing the changes in marine environmental factors on which the changes in the biological productivity of the sea primarily depend. The analysis of the causes of the seasonal and multiannual changes in the intensity of reproduction among the fish and food organisms in the commercial fisheries involved provides a basis for determining the patterns of the relationships between organic and inorganic nature in the ocean.

Proof is advanced of the existence of definite and unified systems of regularities and patterns operating on an all-embracing planetary scale to govern marine regimes, fish reproduction, and fish-food proliferation.

An attempt is made to establish the correlations between multiannual fluctuations in marine conditions and fishery productivity on the one hand and universal processes on the other, above all the multiannual periodicity of tidal phenomena in the Atlantic Ocean, on which depend the fluctuations in the intensity of flow of warm Gulf Stream waters into the northern seas.

The study deals with the Barents, Norwegian, Greenland, Baltic, White, Azov, Black, Caspian, and Aral Seas - the bodies of water constituting the principal venues of Russian national fisheries.

The author proposes new prognostication methods depending on the elements of the marine regimes which are most closely associated with the reproduction of marine organisms and fishery species. (A. D. D.)

7042. Rigler, F. H. (Dept. of Zoology, Univ. of Toronto, Toronto, Ontario, Canada). 1964. THE CONTRIBUTION OF ZOOPLANKTON TO THE TURNOVER OF PHOSPHORUS IN THE EPILIMNION OF LAKES. The Canadian Fish Culturist, Issue 32, pp. 3-10.

A brief review is presented outlining the extent radioactive tracers have been utilized to provide knowledge concerning the cycle of phosphorus and the role of zooplankton in this cycle.

7043. Freeman, Reino S. (Ontario Research Foundation, 43 Queen's Park, Toronto 5, Ontario, Canada). 1964. FLATWORM PROBLEMS IN FISH. The Canadian Fish Culturist, Issue 32, pp. 11-18.

This brief review indicates that little experimental work has been done to study the effect of flatworm parasites on the health of fish. There are records of extensive fish mortality in natural waters due to flatworms, but apparently such catastrophes are uncommon. Generally, young fish are more seriously affected than old fish, and this usually results when they are crowded. While it is uncertain if digenetic flukes cause loss of condition in fish, some cestodes definitely have an adverse effect. It appears that much of the harm caused by flatworms is mechanical, a function of size, the larger cestodes being more serious than smaller flukes, although there may be adverse biochemical effects as well. The host usually isolates parenterally located flatworms into cysts of connective tissue, a response adequate to cope with the usual light infections. There is convincing evidence that immunity develops against a particular monogenetic fluke, but neither effective premunition nor immunity has been

demonstrated against digenetic trematodes or cestodes. (Auth. Summ.)

7044. Snieszko, S. F. (Eastern Fish Disease Lab., Leetown (P. O. Kearneysville), West Virginia). 1964. SELECTED TOPICS ON BACTERIAL FISH DISEASES. The Canadian Fish Culturist, Issue 32, pp. 19-24.

The status of bacterial fish diseases is reviewed in this paper presented at the annual meeting of the Canadian Committee on Fresh-water Fisheries Research at Ottawa on January 7, 1963. The author concludes that the best promise for a long-range and effective control of fresh-water fish diseases is not in drugs and disinfectants, but in understanding of the genetic resistance to diseases, and in furnishing the hatchery fish with the optimal environmental conditions.

7045. Saunders, J. W., and M. W. Smith (Fish. Res. Bd. of Canada, Biol. Sta., St. Andrews, N. B.). 1964. PLANTING BROOK TROUT (SALVELINUS FONTINALIS (MITCHILL)) IN ESTUARIAL WATERS. The Canadian Fish Culturist, Issue 32, pp. 25-30.

Planting hatchery-reared brook trout of the year in the estuary of Ellerslie Brook, Prince Edward Island, resulted in a survival of 28 percent to the anglers in the following season. These fish, age 0 and approximately 4-1/2 inches in length, could have experienced salinities ranging from 0 to 30 0/00. (Auth. Abst.)

7046. Muir, Barry S., and John G. Sweet (Univ. of Toronto, Toronto 5, Ontario). 1964. THE SURVIVAL, GROWTH AND MOVEMENT OF ESOX MASQUINONGY TRANSPLANTED FROM NOGIES CREEK SANCTUARY TO PUBLIC FISHING WATERS. The Canadian Fish Culturist, Issue 32, pp. 31-44.

With the exception of 1956 and 1959, each fall since 1952 muskellunge have been netted, tagged, and transplanted from Nogies Creek Sanctuary to the nearby public fishing waters of Pigeon and Sturgeon Lakes. Anglers were requested to return the tags with pertinent information. The growth of tagged fish suggests that the public lakes provided conditions that were somewhat better for growth than Nogies Creek. There was no evidence that the transplanted fish contributed to the spawning stock. The low percentage return of fish younger than age group V suggests that, unless an extremely large number of tags are lost during the second year, these sub-adult fish do not survive in sufficient numbers to warrant transplanting from Nogies Creek. Justification for this inefficient practice is that if the sanctuary were opened it would be quickly exploited by a few anglers and much damage would be done to the concentrated juveniles. Transplanting, although it decreases the utilization, spreads the additional catch over the entire angling population. Additional studies on tag losses, mortality and contribution to the total catch are under way.

7047. Ghittino, Pietro (Istituto Zooprofilattico Sperimentale del Piemonte e della Liguria, Centro per lo Studio delle Malattie dei Pesci, Via Bologna, 148 - Torino, Italy). 1962. DIFFERENTIAL-DIAGNOSE DER BEI REGENBOGENFORELLEN VORKOMMENDEN "LIPOIDEN LEBERDEGENERATION" UND "INFEKTIÖSEN NIERENSCHWELLUNG UND LEBERDEGENERATION" AUF GRUND HISTOPATHOLOGISCH-ANATOMISCHER UNTERSUCHUNGEN. Zeitschrift für Fischerei, Band XI N. F., Heft 7/8, pp. 549-556.

Based upon macro- and microscopical lesions a differential diagnosis can be made between the "lipoid liver degeneration" (LLD) and the "infectious kidney swelling and liver degeneration"(IKSLD).

As to macroscopical lesions disseminated hemorrhages all over the body are typical for the IKSLD and an ochre-colored liver for the LLD. It is to be regarded that if both lesions are demonstrable, the IKSLD may secondarily occur in rainbow trout primarily affected with LLD.

Microscopically for the IKSLD necrobiotic lesions (pycnosis, karyolysis, vacuolisations, etc.) are specific; the LLD is indicated by ceroid deposition and the missing of necrobiotic lesions in the cells of the liver.

The kidney swelling even if caused by lymphoid hyperplasia is due to IKSLD. However, a general anemia and hydrohemia demonstrable in some cases of LLD or so-called liver cirrhosis (HEPATOMA) with dropsy may cause such a swelling too. In this case, the swelling histologically consists mainly of scattered edema in the whole kidney. (Auth. Summ.)

7048. Nehring, Dietwart (Aus dem Institut für Fischerei der Deutschen Akademie der Landwirtschaftswissenschaften zu Berlin, Abteilung für Chemie, Berlin-Friedrichshagen, Germany). 1962. UNTERSUCHUNGEN ÜBER DIE TOXIKOLOGISCHE WIRKUNG VON THALLIUM-IONEN AUF FISCHE UND FISCHNÄHRTIERE. Zeitschrift für Fischerei, Band XI N. F., Heft 7/8, pp. 557-562.

Investigations on the toxicity of thallium ions showed the following threshold values (entrance of a damage within 3 days):

Rainbow trout (Salmo gairdneri) 10-15 mg/l, perch (Perca fluviatilis) 60 mg/l, roach (Rutilus rutilus) 40-60 mg/l, water-flea (Daphnia spec.) 2-4 mg/l and Gammarus spec. 4 mg/l. When exposed to permanent action and lower concentrations of thallium, the experimental fishes were inimically affected. Toxicologically thallium raises the blood pressure. Typical characteristics of a neurotic toxicant were observed in both fish and fish food organisms. (Auth. Summ.)

7049. Hardisty, M. W. (Bristol Coll. of Science and Technology, Bristol, England). 1964. THE FECUNDITY OF LAMPREYS. Archiv für Hydrobiologie, Band 60, Heft 3, pp. 340-357.

The possibility has been examined of distinguishing the ammocoetes of L. planeri and L. fluviatilis by means of random counts of oocytes in transverse sections of the gonads. The highest

number of L. planeri was found to be 50 and in L. fluviatilis 110, but the lower ranges of oocyte counts in the river lamprey ammocoete overlap those of the brook lamprey.

In larval brook lampreys estimates of the total numbers of oocytes in the whole ovary varied from 5,000-10,000 with a mean value for 13 animals of 7,600 compared with an average egg production of 1,400 for adults of this species.

Estimates of total oocyte numbers for ammocoetes assigned to L. fluviatilis varies from 11,000-26,000 and egg counts on adult river lampreys from the Severn River from 7,500-28,000. For adults of L. fluviatilis from the Trent River egg counts varied from 26,000-41,000.

Total oocyte numbers of 114,000-165,000 have been recorded in ammocoetes of the dwarf landlocked form of the sea lamprey P. marinus compared with an average egg number of about 61,000 for the adults. Counts made on 4 ammocoetes of the anadromous sea lamprey gave figures varying from 182,000-213,000.

Various alternative explanations have been examined to account for the differences in potential fecundity of brook lamprey ammocoetes and typical river lampreys. Variability of river lamprey populations in regard to size, fecundity and the duration of the trophic period has been discussed in the light of the possible origin of the brook lamprey type by selection from the extreme lower range of such variants.

Comparisons have been made of the fecundity of adult lampreys of various species relative to body weight. Relative fecundity appears to be highest in the non-parasitic and non-migratory brook lampreys and lowest in the anadromous sea lamprey.

The significance of the smaller oocyte numbers of the dwarf sea lamprey P. marinus compared with the anadromous form is discussed in relation to the mode of differentiation of the landlocked race. (Auth. Summ.)

7050. Thomson, Donald A. (Dept. of Zoology, Univ. of Arizona, Tucson). 1964. OSTRACITOXIN: AN ICHTHYOTOXIC STRESS SECRETION OF THE BOXFISH, OSTRACION LENTIGINOSUS. Science, Vol. 146, No. 3641, pp. 244-245.

Boxfish under stress produce an ichthyotoxic, hemolytic, nonprotein poison in the mucous secretions of their skin. This heat-stable, nondialyzable "ostracitoxin" foams profusely in aqueous solutions and is toxic to various biological systems. It is apparently unique among known fish poisons; it is toxic to boxfish and resembles red tide and sea cucumber toxins in general properties. (Auth.)

7051. Taylor, V. R. (Dept. of Fish. of Canada, St. John's, Newfoundland). 1964. A RETRACTABLE TRANSDUCER FOR SMALL BOAT ECHO SOUNDING. The Canadian Fish Culturist, Issue 32, pp. 45-52.

A housing is described that will permit a transducer to be retracted for protection when a boat is being landed or moved by trailer.

7052. Kupka, K. H. (Dept. of Fish. of Canada, Vancouver, B. C.). 1964. A FALSE WEIR FISHTRAP. The Canadian Fish Culturist, Issue 32, pp. 53-58.

This report describes a new fishtrap installation that was designed for the Stamp Falls Fishway for the purpose of trapping coho and spring salmon for transplant into the Robertson Creek Spawning Channel.

Fish are attracted to an artificial waterfall and jump into an anesthetic pool where they can be taken out for inspection, tagging or transportation for transplant. The principle of the false waterfall has been used on at least one previous occasion in connection with fish trapping. This was at the Trinity River facilities operated by the California Department of Fish and Game under agreement with the United States Bureau of Reclamation. (Auth. Abst.)

7053. Boyd, F. C. (Fish Culture Br., Dept. of Fish. of Canada, Vancouver, B. C.). 1964. RETURN OF PINK SALMON TO ROBERTSON CREEK SHOWS PROMISE OF SUCCESS. The Canadian Fish Culturist, Issue 32, pp. 59-62.

A series of pink salmon (Oncorhynchus gorbuscha) egg transplants was begun in 1959 to test the feasibility of establishing sizeable runs of pink salmon in the Somass River system on Vancouver Island.

Two relatively small and three major transplants have been made to date. The results of the small transplants showed that pink salmon would return to this new stream but the numbers were so small that there would be little hope of establishing a continuing run. The returns from the first major transplant were very encouraging when upwards of 4700 fish entered the river and spawned from mid-August to early October (1963).

7054. Coutant, Charles C. (Dept. of Biology, Lehigh Univ., Bethlehem, Pennsylvania). 1964. INSECTICIDE SEVIN: EFFECT OF AERIAL SPRAYING ON DRIFT OF STREAM INSECTS. Science, Vol. 146, No. 3642, pp. 420-421.

There was a rise in the rate of drift of aquatic insects in a stream contained within an area of woodland sprayed with Sevin for control of the gypsy moth. It appears from the pattern of drift that there was a drastic reduction of the standing crop of stream insects as a result of the spraying. (Auth. Abst.)

7055. McKee, Thomas B., and Wallace F. Hublou (Fish Comm. Research Lab., Route 1, Clackamas, Oregon, 97015). 1963. AN ATTEMPT TO MARK JUVENILE SILVER SALMON BY FEEDING SELECTED METALLIC COMPOUNDS. Oregon Fish Comm., Research Briefs, Vol. 9, No. 1, pp. 27-29.

Manganese and strontium commonly occur in fish and are, for this reason, unsuitable for marking purposes. Cobalt was toxic to silver salmon at the 1.0 gram per day level. It was not found in the ash or scale samples, but was probably not fed long

enough to be absorbed in detectable quantities. Bismuth offers promise as a method of marking fish as it was non-toxic and readily deposited in scales and bony tissue when included in the diet. These preliminary studies point up the need for further experiments using bismuth compounds to determine how long the element remains identifiable in scales and bones. Methods of introducing bismuth in the fish other than by diet should be explored. (Authors)

7056. Pulford, Earl F., and Lawrence M. Woodall (Fish Comm. Research Lab., Route 1, Clackamas, Oregon, 97015). 1963. AN OPERCULUM MARKING EXPERIMENT ON JUVENILE CHINOOK SALMON. Oregon Fish Comm., Research Briefs, Vol. 9, No. 1, pp. 30-36.

In searching for methods of marking juvenile salmonids, a study to determine the practicality of marking by removal of a portion of the operculum was conducted. No statistically significant differences in mortality were determined among marked and unmarked groups of salmon. No significant differences between the marked and unmarked salmon in growth, based on length and weight measurements, were obtained. Within 112 days, the clipped opercula regenerated in the fry group to a point where differentiation between marked and unmarked chinook by direct observation became inaccurate. The same was true when members of the group marked as fingerlings were held for 82 days after marking. It appears, therefore, that clipping the operculum in fish of this size does not produce a suitable mark for use in chinook salmon studies lasting as long as four months. However, the technique may have some use in short-term experiments. (Authors)

7057. Leith, David A., and Ellis J. Wyatt (Fish Comm. Research Lab., Route 1, Clackamas, Oregon, 97015). 1963. LENGTH-WEIGHT RELATIONSHIP OF ARTIFICIALLY PROPAGATED JUVENILE SILVER SALMON. Oregon Fish Comm., Research Briefs, Vol. 9, No. 1, pp. 37-41.

The length-weight relationship for juvenile silver salmon reared at Oregon Fish Commission hatcheries was computed by the least squares method. A total of 2,246 fish was weighed and measured throughout the rearing periods of the 1958 and 1959 broods. The fish ranged from 46 to 140 millimeters in fork length and from 1.0 to 37.0 grams in weight. The length-weight relationship was determined to be $W = 0.00001251\ L^{2.98581}$ where W = weight in grams and L = fork length in millimeters. (Authors)

7058. Burck, Wayne A., and Irving W. Jones (Fish Comm. Research Lab., Route 1, Clackamas, Oregon). 1963. SUMMER STEELHEAD TAGGING EXPERIMENTS AT McNARY DAM IN 1955 AND 1956. Oregon Fish Comm., Research Briefs, Vol. 9, No. 1, pp. 42-51.

Angling accounted for over 40% of the recoveries from the January tagging period but only 9% from the April tagging period. Dam traps and research fyke nets accounted for less than 50% of the recoveries from the January tagging but almost 80% from the April tagging.

Males were estimated to comprise 33% and 48% of the fish tagged during the April 1955 and February 1956 tagging periods, respectively.

The proportion of small and large fish tagged varied with the tagging period. However, the proportion of large fish (26 inches and longer) recovered was greater than the proportion tagged for each period. The Clearwater River has a run of predominantly "large" steelhead.

The earlier tagged fish migrated at a slower rate (2.0-2.4 miles per day) than the later tagged fish (7.6 miles per day). Although 75 days separated the two tagging periods in 1955, 75% of the combined recoveries at Lewiston Dam on the Clearwater River appeared during a 21-day period. Fluctuations in the counts of tagged steelhead corresponded with fluctuations in the counts of untagged steelhead at both McNary and Lewiston dams. (Authors)

7059. McKee, Thomas B., James W. Wood (Fish Comm. Research Lab., Route 1, Clackamas, Oregon, 97015), Russell O. Sinnhuber, Duncan K. Law, and T. C. Yu. 1963. EIGHTH PROGRESS REPORT ON SALMON DIET EXPERIMENTS. Oregon Fish Comm., Research Briefs, Vol. 9, No. 1, pp. 52-56.

Three ingredients were evaluated as additives to the Oregon test diet: (1) additional vitamin B_{12} - did not noticeably affect fish growth or gill color but mortality increased somewhat over that of fish fed the test diet; (2) Rita-liver - produced slightly better growth and less mortality than the test diet but seemed to have an adverse effect on gill color; and (3) albacore tuna liver - greatly improved growth, substantially lowered mortality, and improved gill color.

Solvent-extracted linseed and cottonseed-oil meals, tested separately as replacements for portions of the Oregon test diet, produced very poor growth, increased mortality, and poorer gill color than the test diet. However, linseed meal was not found to be fatal for chinook salmon as has been reported for brook trout. Although both linseed and cottonseed meals produced poor growth results, they were observed to possess good binding qualities, especially linseed meal.

Dried skim milk, substituted for portions of the Oregon test diet, produced slightly less growth, increased mortality, and poorer gill color than the test diet. (Authors)

7060. Hublou, Wallace F., Thomas B. McKee (Fish Comm. Research Lab., Route 1, Clackamas, Oregon, 97015), Duncan K. Law, Russell O. Sinnhuber, and T. C. Yu. 1963. NINTH PROGRESS REPORT ON SALMON DIET EXPERIMENTS. Oregon Fish Comm., Research Briefs, Vol. 9, No. 1, pp. 57-62.

The following drum-dried fish meals produced very good growth as partial casein replacements in the Oregon test diet: dogfish, Bellingham sole, yellowfin tuna viscera, and Pacific cod. Commercially prepared animal blood meal produced very poor

growth when tested in the same manner and was discontinued after 6 weeks because of the debilitated condition of the fish.

Deletion of crab meal from the Oregon test diet resulted in a somewhat lessened growth response. Shrimp meal, substituted for crab meal, produced better growth than the control containing crab meal.

Other ingredients tested as additives to the Oregon test diet produced the following results: (1) herring solubles--good growth; (2) distillers solubles--fair growth (slightly better than the test diet); (3) wheat germ meal--fair growth; and (4) fresh-frozen beef lungs--good growth.

Mortality rate in the test lots was 6% or less, resulting mainly from a deformed condition present in fish in all lots.

Blood condition, as observed by gill-color and hemoglobin determinations, varied somewhat between lots but all diets produced satisfactory results. (Authors)

7061. Mraz, Donald (Wisconsin Conservation Dept., Madison, 53701). 1964. EVALUATION OF LIBERALIZED REGULATIONS ON LARGEMOUTH BASS, BROWNS LAKE, WISCONSIN. Wisconsin Cons. Dept., Technical Bulletin No. 31, 24 pp.

The effects of liberalized angling regulations (no size limit and an earlier opening) on a largemouth bass (Micropterus salmoides) population were evaluated over a six-year period (1952-57) at Browns Lake, Racine County, Wisconsin.

Partial creel censuses produced catches of 2,671 bass in 1953 and 1,252 in 1955. Fishing pressure amounted to 75 and 63 hours per acre for the respective years. In 1953, 60 percent of the bass caught were over 10 inches long and in 1955, 75 percent were 10 inches or longer. Angler rejection of small fish after the no-size-limit novelty had worn off is given as the reason for this variation in the anglers' catch. Age-groups II, III, and IV combined accounted for 68 to 83 percent of all fish sampled, whether caught by anglers or seine hauls. Changes in the age composition of the population occurred from year to year because of uneven recruitment of year classes.

Growth rates were slightly better in 1955 and 1957 than when the study was initiated in 1953, for years of life 3 through 6. No steady and progressive increase was apparent, however. Browns Lake bass reached 10 inches during the fourth growing season, averaged 15.6 inches at the end of seven, and few fish were found to be older than eight years.

The total population of largemouth bass was estimated by the mark and recapture technique to include 21,980 fish over 6 inches long in 1953, 14,698 in 1955, and 14,115 in 1957. Data are presented which indicate that largemouth bass are caught somewhat more easily just prior to spawning, while on the nests, or guarding young fish. However, reproduction and recruitment did not appear to be adversely affected during the study period.

The liberalization of bass regulations afforded increased opportunity for anglers to pursue their sport, without harm to the bass population during the study period. (Auth. Abst.)

7062. Cope, Oliver B. (Fish-Pesticide Research Lab., Denver, Colorado). 1964. REVISED BIBLIOGRAPHY ON THE CUTTHROAT TROUT. U. S. Fish and Wildlife Service Research Report 65, 43 pp. (Avail.: Supt. of Documents, U. S. Govt. Printing Office, Washington, D. C., 20402, price 35 cents.)

This paper is a compilation of 221 abstracts of publications on the biology, culture, distribution, and management of the cutthroat trout, Salmo clarki Richardson. The 1958 publication, "Annotated Bibliography on the Cutthroat Trout," contained 135 abstracts, which have been incorporated with recent ones to form the present report. (Auth. Abst.)

7063. Allison, Darrell (Ohio Div. of Wildlife, 1500 Columbus Road, Columbus). 1964. COPPER SULFATE USED IN BLUEGILL POPULATION CONTROL. Ohio Dept. of Natural Resources, Publication W-10, 6 pp.

This study was conducted to develop a simple, selective, and inexpensive method of bluegill population control. A common, inexpensive, moderately safe, and easily used chemical, copper sulfate, was experimentally applied to spawning beds to accomplish nest destruction. The study was conducted in 1956 at Allen Lake, which contains 2.75 surface acres of water; total hardness was high, and water very transparent. Application procedures and rates described were adequate to produce lethal effects on bluegill eggs and fry, and prevented re-nesting during the summer months of the experiment. This population control technique could be of most value in small water areas, particularly farm ponds, with moderately clear water. For safety in use, it would not be recommended for water areas having a hardness of less than 75 ppm. This technique could be safely and inexpensively practiced by the average farm pond owner, with a minimum of ordinary equipment and technical planning. (Auth. Abst.)

7064. Kinney, Edward C. (U. S. Bur. Sport Fish. & Wildl., Washington, D. C., 20240). 1964. FISHERY MANAGEMENT SERVICES ANNUAL REPORT FOR 1963. U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife Circular 194, 46 pp.

Assistance in the management of fishing resources was provided at 300 Federal areas and Indian reservations which contain approximately 415,000 acres of lakes, ponds, and reservoirs and 5,400 miles of streams. These waters provided more than 3,333,000 man-days of angling. Federal-State cooperative fishery studies were carried out on an additional 84,000 acres of impounded waters

and 2,700 miles of streams. Special studies and activities of the cooperative fishery units are also presented.

7065. Jessen, Robert, and Richard Lound (Div. of Game and Fish, Minnesota Dept. of Conservation, 658 Cedar Street, St. Paul). 1962. AN EVALUATION OF A SURVEY TECHNIQUE FOR SUBMERGED AQUATIC PLANTS. Minn. Dept. of Cons. Game Investigational Report No. 6, 10 pp.

Because visual estimation of the abundance of submerged vegetation in lakes and ponds is subject to considerable error, both because of water clarity and personal bias, a sampling technique was developed and tested. Sampling stations are established on a grid pattern with a minimum of 50 sites for a small shallow lake. Each sampling station is a circle with a 6-foot radius. From the center of the circle four casts are made with an 8-inch wide long-handled rake, one in each quadrant of the circle and density of growth recorded by the number of casts in which any particular kind of plant is recorded; rating 5 (rank) if recovery in all four casts and the teeth of the rake full; rating 4 (heavy) if present in all four casts; rating 3 (moderate) if taken in 3 of the 4 casts; rating 2 (scattered) if taken in 2 of the 4 casts and rating 1 if taken in only 1 of the 4 casts. Uniformity of results by this method were tested by four crews on Little Coon Lake, Anoka County, Minnesota, each of whom first estimated plant growth density visually (as anticipated rake recovery) at each station and then determined the density by rake casts. The results indicate the technique is valid within the experimental error and that no significant differences existed between visual and rake determinations. (Authors)

7066. Keup, Lowell, and Jack Bayless (North Carolina Wildlife Resources Comm., Ayden). 1964. FISH DISTRIBUTION AT VARYING SALINITIES IN NEUSE RIVER BASIN, NORTH CAROLINA. Chesapeake Science, Vol. 5, No. 3, pp. 119-123.

Fish were collected from 18 Neuse River tributary stations that varied in salinity from fresh-water to 12.25 0/00. More fresh-water than salt-water species were collected in salinities of less than 3.50 0/00. Fresh-water fishes outnumbered salt-water and brackish-water individuals up to salinities of 2.63 0/00. Fresh-water game fishes were found in higher percentages in collections from stations with 1.75 to 3.50 0/00 salinities than in those from fresh-water stations. Few fresh-water fishes were found in salinities greater than 10.50 0/00. Fresh-water game fishes were not abundant in salinities above 3.50 0/00. (Authors)

7067. McMahon, John W. (Virginia Inst. of Marine Science, Gloucester Point). 1964. MONOGENETIC TREMATODES FROM SOME CHESAPEAKE BAY FISHES. PART II. THE SUPERFAMILY DICLIDOPHOROIDEA. Chesapeake Science, Vol. 5, No. 3, pp. 124-133.

Nine species of monogenetic trematodes from Chesapeake Bay fishes are reported. Four previously described species that are studied comparatively, redescribed, and discussed are: Microcotyle poronoti MacCallum, M. peprili Pearse, M. pomatomi Goto, and Thoracocotyle crocea MacCallum. This constitutes a new locality record for all species. (Auth. Abst.)

7068. Nicholson, William R. (Bur. Comm. Fish. Biol. Lab., Beaufort, North Carolina). 1964. GROWTH COMPENSATION IN FOUR YEAR CLASSES OF STRIPED BASS, ROCCUS SAXATILIS, FROM ALBEMARLE SOUND, NORTH CAROLINA. Chesapeake Science, Vol. 5, No. 3, pp. 145-149.

Compensatory growth, the tendency of smaller individuals to catch up with larger individuals, was measured by linear regression coefficients for four year classes of striped bass, Roccus saxatilis (Walbaum), from Albemarle Sound, North Carolina. Samples were obtained annually from late October to March 1955-1958. Annual scale growth was used as a measure of annual linear body growth. Compensatory growth was shown to occur in year II and year III when compared with growth in year I, and in year III when compared with growth in year II. There was no significant difference in the amount of compensatory growth among the four year classes studied. (Auth. Abst.)

7069. White, John C., Jr., and Donald E. Hoss (U. S. Bur. Comm. Fish., Radiobiological Lab., Beaufort, North Carolina). 1964. ANOTHER RECORD OF INCOMPLETE AMBICOLORATION IN THE SUMMER FLOUNDER, PARALICHTHYS DENTATUS. Chesapeake Science, Vol. 5, No. 3, pp. 151-152.

A specimen of the summer flounder, Paralichthys dentatus, exhibiting incomplete ambicoloration was recently caught off North Carolina. The capture of this fish supports the suggestion that identical genetic factors or environmental combinations may cause the phenomenon. (Authors)

7070. Domanevsky, L. N. (Baltic Research Inst. of Marine Fishery Management and Oceanography, Kaliningrad, U.S.S.R.). 1963. GROWTH CHARACTERISTICS OF THE PIKE (ESOX LUCIUS L.). Zoologicheskiy Zhurnal, Moscow, Vol. 42, No. 10, pp. 1539-1545; U. S. Dept. of Commerce, Office of Technical Services, JPRS: 22, 702, pp. 51-63, price $2.25.

The growth of the pike within its distribution range varies considerably and is influenced by the geographical position of the water body and its hydrological and biological peculiarities. In water bodies with stagnant water (lakes, ponds, water reservoirs) the pike grows better than in rivers located in the same latitudes. Non-mature individuals which do not attain maturity during the year have a longer period of growth. The shortest periods of growth are found in mature fishes that have participated in spawning. With age, a relative role of the weight of gonads in the yearly sum-total gain

of weight of the fish becomes evident. In generations and single individuals with a better growth, the increase of gonad growth proceeds more rapidly and their indices are higher in similar year cycles. Growth intensity of the pike depends upon the yield of other fishes.

7071. Nigrelli, Ross F., and Henry Vogel (New York Aquarium, New York, N. Y.). 1963. SPONTANEOUS TUBERCULOSIS IN FISHES AND IN OTHER COLD-BLOODED VERTEBRATES WITH SPECIAL REFERENCE TO MYCOBACTERIUM FORTUITUM CRUZ FROM FISH AND HUMAN LESIONS. Zoologica, Vol. 48, No. 3, pp. 131-143.

A survey of fishes in the New York Aquarium and a search of the literature show that tuberculosis in these animals and in other poikilotherms is more prevalent than is generally suspected. The disease has been found in 151 species of fishes, 11 species of amphibians and 24 species of reptiles. In the N. Y. Aquarium, tuberculosis was present in 40 species of fishes, especially in tropical freshwater forms belonging to the families Characidae, Cyprinidae and Poecilidae. Of special interest is the report that the acid-fast bacillus isolated from the Neon Tetra (Hyphessobrycon innesi) is identical with Mycobacterium fortuitum, a human pathogen. The pathology of tuberculosis in the fishes studied in the Aquarium is described and the taxonomy of mycobacteria from cold-blooded vertebrates is briefly discussed. (Authors)

7072. Honma, Yoshiharu, and Eimitsu Tamura. 1963. STUDIES ON THE ENDOCRINE GLANDS OF THE SALMONOID FISH, THE AYU, PLECOGLOSSUS ALTIVELIS TEMMINCK & SCHLEGEL. V. SEASONAL CHANGES IN THE ENDOCRINES OF THE LANDLOCKED FORM, THE KOAYU. Zoologica, Vol. 48, Issue 1, pp. 25-31.

The changes occurring in the thyroid, pituitary, adrenal cortical tissue and gonads of the landlocked salmonoid fish, Plecoglossus altivelis T. & S., (Koayu) throughout its life span were examined histologically and compared with those of the anadromous form of the same species (Ayu).

Two peaks of thyroid activity were plotted in the spring and summer runners, compared with only one peak of gland activity in the Ayu. A possible relation between thyroid function and the upstream migratory behavior or active locomotion of the fish is suggested.

The time of appearance of the so-called basophil islands in the ventral region of the pituitary gland coincides well with the onset of ovarian vitellogenesis and spermatid formation. These aniline blue-, PAS- and AF-positive, polygonal cyanophils seem to be the source of gonad-stimulating hormone. A decrease in the number of cyanophils was detected in spent fish.

A marked increase in the amount of adrenal cortical tissue takes place following the maturation of the gonads. There is, however, no extreme vascularity nor internal hemorrhage such as is found in the hyperplastic tissue of the Ayu.

Gametogenesis occurs about one month earlier than in the Ayu. Development of the ovarian eggs of the Koayu might be classified as partial synchronism. Whether young oocytes originate from the residual oogonia in the ovigerous folds of spent ovary and whether spermatogonia regenerate in the cyst wall of the spent testis is still uncertain.

The process of formation of corpora lutea in the atretic eggs and the absence of an ultimate corpus luteum structure coincides with what has been found in the Ayu. (Authors)

7073. Bank, O. 1963. LEISTUNGSANALYSE DES KARPFENSTAMMES HÖCHSTADT (AISCH). Archiv für Fischereiwissenschaft, Vol. XIV, No. 1/2, pp. 18-32.

The carp stock of Höchstadt (Aisch) has been tested as to its productive tendency by means of the allometric relations of weight and length (G/L) and weight and height (G/H) respectively. The results of these relations are straight lines characterized by their angles of inclination towards the abscissa and their position in the space - the start. The tangent of the angle of inclination α results in the constant a, in the distributive mechanism of the feeding substances between the analyzed relative quantities (distributive constant).

The allometric conditions in the carp stock of Höchstadt (Aisch), however, are formative, but they can only be little influenced by certain surrounding conditions, such as hibernation or additional feeding. Owing to their starting conditions, the K III carp of the first generation in the experiment are relatively heavier than the K II, i. e., in the G/L relation as well as in the G/H relation. The distributive constants of both age-groups are very similar. In the G/L relation, however, the K III carp of the second generation of the experiment are longer than the K III carps of the first generation with the same weight. Having the equal weight, they have developed from the shorter and less higher K II carp, when they have been of the same age.

There is the possibility that these tendencies of productivity have been initiated by the selection of the spawning animals. It is not possible to maintain a certain development by selecting future spawners by their exterior appearance, even if the fishes are being measured and weighed. For the selection of future spawners, it is suggested to pursue a selecting method established according to the allometric straight lines. (Auth. Summ.)

7074. Molnár, Gyula, and István Tölg (Zool. Inst. of the Univ. for Agric. Sci., Gödöllö, Hungary). 1963. VERSUCHE ZUM ERKENNEN DER MECHANISCHEN MAGENTÄTIGKEIT EINIGER SÜSSWASSERRAUBFISCHE. Archiv für Fischereiwissenschaft, Vol. XIV, No. 1/2, pp. 33-39.

Studies were conducted on the mechanical functioning of the stomach of several fresh-water fishes of prey. Included were the pikeperches, Lucioperca lucioperca (L.) and Lucioperca volgensis (Gmelin); perch, Perca fluviatilis L.; largemouth bass,

Micropterus salmoides Lacépède; sheatfish, Silurus glanis L.; catfish, Ictalurus nebulosus (Le Sueur); and pike, Esox lucius L. X-ray photographs about the stomachs of artificially-stuffed test fishes were taken every 5 to 6 hours. Significant differences of the mechanical functioning of scrutinized fish species were noted. The stomach contents of Lucioperca lucioperca, L. volgensis, and perch hardly move; however, the food moves considerably in the stomachs of the sheatfish, largemouth bass and catfish. When evaluating the results from the aspect of enzyme kinetics, we have to take into account food motion on the rapidity of digestion in the stomach.

7075. Lauer, F. J. 1963. DAS WASSER ALS GEOLOGISCHER LEITER, SEIN IONENVERHALTEN UND IONENSTÖRUNGEN IM HINBLICK AUF DIE ELEKTROFISCHEREI. Archiv für Fischereiwissenschaft, Vol. XIV, No. 1/2, pp. 39-48.

According to existing investigations, determination of electrical conductivity of water by means of conventional measuring instruments need not definitely be a criterion for the efficiency of an electrical fishing gear. The author distinguishes, within the various types of water, first- and second-class conductors, half-conductors and, as a combination, the so-called "geological conductors." While the first-mentioned types contain the anions and cations existing in the water, the geological conductors also include certain separated particles of geological ingredients of the bottom, so that they, beside the Ohm-resistance, particularly contain the capacitive electrical resistance, which cannot be measured with the usual instruments. The geological conductor includes all parts of fluid, gaseous and solid ingredients of the mixed body, thus also all gas bubbles, mineral crystals, mineral associations, either colloidally dissolved or suspended in the fluid medium, or sedimented on the bottom, the basis layer included.

The conditions of conductivity in a water are consequently very complex, if adsorptions of ions to suspensoids occur. The normally existing so-called swarm-ions in waters can thus be caught by geological and also by organic suspending substances which exchange ions developing polycations and polyanions. Owing to heavy friction with the water, the speed of migration is so low that it is not sufficient for a normal direct current, so that the Ohm-resistance is almost nil. The polyions, however, act like contrarily loaded condenser plates permitting the formation of dielectric displacement currents. Measured with measuring instruments for alternating current, they pretend good conductivities, whereas the electrical fishing gear for direct current does not indicate any fishing results because the water does not absorb direct current energy. (Auth. Summ.)

7076. Siebert, G., and I. Bottke. 1963. ENZYME IN DER LEIBESHÖHLE VON FISCHEN. Archiv für Fischereiwissenschaft, Vol. XIV, No. 1/2, pp. 57-68.

The peritoneal cavity of carp and trout was rinsed with saline. This rinsing fluid, as well as the tissues which are in close vicinity of the peritoneal cavity, were assayed for enzyme activities. The rinsing fluid of carp contains a catheptic protease, amylase, ribonuclease, as well as several glycolytic enzymes. In addition, a trypsin-like, a catheptic, and a pepsin-like protese, amylase and ribonuclease were found in the rinsing fluid of trout. Very probably, the enzymes found in the abdominal cavity leak out from digestive glands or from the surrounding muscle tissue respectively, during normal life conditions. There are peculiarities among carp and trout proteases, which permit their differentiation from each other and from corresponding mammalian enzymes; this is briefly discussed. (Auth. Summ.)

7077. Halsband, E., and I. Halsband. 1963. VERÄNDERUNGEN DES BLUTBILDES VON FISCHEN INFOLGE TOXISCHER SCHÄDEN. Archiv für Fischereiwissenschaft, Vol. XIV, No. 1/2, pp. 68-85.

The investigations indicate that, in the range of the threshold of disturbance, the blood state is already definitely affected, although the fish does not yet show any visible defects but some physiological changes. These changes in the blood state have been ascertained by investigating the hematocrit value as well as by measuring the number and surface-size of the red blood corpuscles. Depending on the influencing substance, the surface is either diminishing or enlarging; the same occurs with the hematocrit value. During the first days, changes of the size of the surface are compensated by a changed number of red blood corpuscles. In the case of radiation by X-rays, the changes can still be balanced until the second day, subsequently intensive damage of the blood state is developing which can no longer be adjusted. (Authors)

7078. Riedel, Dietmar. 1963. CONTRIBUTION TO THE EXPERIMENTAL DETERMINATION OF THE SELECTION PARAMETER OF GILL NETS. Archiv für Fischereiwissenschaft, Vol. XIV, No. 1/2, pp. 85-97.

The experiments carried out and evaluation of results obtained could contribute towards experimental determination of the selectivity power of gill nets and part of underlying factors which have a direct impact on the degree of selectivity. Since all experiments were performed with tilapia (Tilapia mossambica) only, conclusions had to be restricted to only that species and similar ones.

It has been found that selectivity of gill nets was in reverse relation to the size of meshes within the experimental range of from 35-50 mm. Equal mesh sizes, when differently hanged, gave extreme variations in results. A considerable reduction of selectivity was evident with increasing coefficients of hanging (1 : 1; 1 : 2; 1 : 3).

Finally, the derivation of selectivity power of gill nets was found to be in relation to the body shape of fish which resulted in an abnormal method

of capture and numerically increased with decreasing mesh sizes and increasing hanging. An attempt has been presented to explain reasons of that particular appearance. Suggestions for further studies conclude the article. (Auth. Summ.)

7079. Copeland, B. J., J. L. Butler, and W. L. Shelton (W. L. Shelton, 1114 N. Gary, Tulsa, Oklahoma). 1961. PHOTOSYNTHETIC PRODUCTIVITY IN A SMALL POND. Proc. Okla. Acad. Sci., 1961 (1962), 42, pp. 22-26; Water Pollution Abstracts, Vol. 37, No. 4, Abst. No. 549. 1964.

A report is given of studies on the oxygen relations in a small pond ("Theta pond") on the campus of Oklahoma State University during the summer of 1961. Photosynthetic productivity, community respiration, and diffusion from the atmosphere were calculated by the construction of 24-hour rate-of-change curves, and the results are discussed on the basis of the productivity: respiration ratio, and in relation to the washing of organic matter into the pond.

7080. Hayes, H. J. 1963. IMPROVEMENTS IN TITRATION APPARATUS. B. P. 904,490; Analyt. Abstr., 1963, 10, Abstr. No. 850; Water Pollution Abstracts, Vol. 37, No. 4, Abst. No. 554. 1964.

Apparatus for improving titration technique, particularly suitable for use in determining hardness of water by titration with EDTA, is claimed. The apparatus includes a series of liquid dispensers, each comprising a reservoir connected, via an electrically-controlled inlet valve, to a measuring chamber equipped with a contact electrode which controls the operation of the inlet valve. The measuring chamber is equipped with an electrically-operated outlet valve with interlocking mechanism which prevents both valves from being open at the same time, and one, or all but one, of the dispensers are arranged to discharge into the other dispenser which serves as a test chamber.

7081. Hoak, R. D., and H. C. Bramer. 1962. COMPARISON OF WINKLER, POLAROGRAPHY AND THE NEW BECKMAN DO ELECTRODE. Proc. 17th industr. Waste Conf., Purdue Univ. Engng. Extn. Ser. No. 112, pp. 366-376; Water Pollution Abstracts, Vol. 37, No. 4, Abst. No. 558. 1964.

The Winkler and polarographic methods for the determination of dissolved oxygen have certain limitations for field use, and the authors, therefore, carried out studies on the usefulness for this purpose of the Beckman platinum-silver electrode. This instrument has a large temperature coefficient, and to obtain direct readings a compensating network, employing an appropriate thermistor, was developed, which gave good linearity over the range 32°-90° F. Laboratory experiments showed good agreement between results obtained with this instrument and those obtained by the Alsterberg-fluoride modification of the Winkler method. Agreement between the Winkler method and a polarographic technique was poor, probably as a result of errors introduced from sample manipulation. Results obtained from river surveys showed the rapidity with which dissolved-oxygen profiles could be obtained with the electrode system.

7082. Hanna, G. P., and R. A. Brant. 1962. STRATIGRAPHIC RELATIONS TO ACID MINE WATER PRODUCTION. Proc. 17th industr. Waste Conf. Purdue Univ. Engng. Extn. Ser. No. 112, pp. 476-492; Water Pollution Abstracts, Vol. 37, No. 4, Abst. No. 632. 1964.

After outlining the geology of typical mining areas in U.S.A., the authors describe laboratory studies on the oxidation and leaching of selected material in an attempt to associate quantitatively the acid-producing potential of certain classes of materials. Some methods for reducing the production of acid mine drainage are indicated.

7083. Cook, L. 1962. SPEARHEADING THE OHIO VALLEY INTERSTATE MINE DRAINAGE CONTROL. Proc. 17th industr. Waste Conf., Purdue Univ. Engng. Extn. Ser. No. 112, pp. 543-545; Water Pollution Abstracts, Vol. 37, No. 4, Abst. No. 633. 1964.

The author outlines measures taken by ORSANCO to control acid mine drainage in the Ohio River valley area and indicates further work which is required on various aspects of this problem.

7084. Douglas, N. H., and W. H. Irwin. 1962. EVALUATION AND RELATIVE RESISTANCE OF SIXTEEN SPECIES OF FISH AS TEST ANIMALS IN TOXICITY BIOASSAYS OF PETROLEUM REFINERY EFFLUENTS. Proc. 17th industr. Waste Conf. Purdue Univ. Engng. Extn. Ser. No. 112, pp. 57-76; Water Pollution Abstracts, Vol. 37, No. 4, Abst. No. 668. 1964.

Although many different fish have been used in toxicity tests, few studies have been made to compare the reactions of different species to a particular toxic agent, and the authors have, therefore, carried out experiments on the resistance of 16 different species of fish to an oil refinery waste water. The fish used were goldfish (Carassius auratus), carp (Cyprinus carpio), orangethroat darter (Etheostoma spectabile), brook stickleback (Eucalia inconstans), mosquitofish (Gambusia affinis), plain minnow (Hybognathus placitus), brook silverside (Labidesthes sicculus), guppy (Lebistes reticulatus), bluegill (Lepomis macrochirus), smallmouth bass (Micropterus dolomieui), white sucker (Catostomus commersoni), plains shiner (Notropis percobromus), bleeding shiner (Notropis zonatus), fathead minnow (Pimephales promelas), rainbow trout (Salmo gairdneri), and creek chub (Semiotilus atromaculatus). Experimental procedure is described and the results are tabulated. Statistical analysis of the 24-hour TL_m showed that the most resistant species was Lebistes reticulatus, followed, in decreasing order of resistance, by C. auratus, G. affinis, C. carpio, P. promelas, E. inconstans, N. percobromus, L. sicculus, M. dolomieui, L. macrochirus, H. placitus, S. atromaculatus, C. commersoni, S. gairdneri, N. zonatus, and E. spectabile. These results

are considered to be more applicable and significant than the 96-hour TL_m, where the order of resistance of some species differed slightly, as most of the deaths occurred within the first 24 hours of testing and little change occurred during the following 72 hours. The characteristics desirable in a fish for use in toxicity tests are discussed; Lebistes reticulatus is considered to be the most convenient species used, as it accepts testing conditions calmly, eats readily, is small and of uniform size, matures quickly, is free of common diseases, is easily raised in the laboratory, and is similar to native American fish in resistance to refinery effluent.

7085. Cairns, J., and A. Scheier. 1962. THE ACUTE AND CHRONIC EFFECTS OF STANDARD SODIUM ALKYLBENZENESULPHONATE UPON THE PUMPKINSEED SUNFISH, LEPOMIS GIBBOSUS (LINN.) AND THE BLUEGILL SUNFISH, L. MACHROCHIRUS RAF. Proc. 17th industr. Waste Conf., Purdue Univ. Engng. Extn. Ser. No. 112, pp. 14-28; Water Pollution Abstracts, Vol. 37, No. 4, Abst. No. 669. 1964.

Results are given of experiments on the long-term effects of exposure to sub-lethal concentrations of alkylbenzenesulphonate of pumpkinseed sunfish, Lepomis gibbosus, and bluegill sunfish, L. macrochirus. The responses of both species to short-term or acute exposure to alkylbenzenesulphonate were similar, though not identical, and the short-term response of L. macrochirus was similar in both hard and soft water and in both batch and continuous-flow tests. Long-term exposure to both 5.6 ppm and 18.0 ppm alkylbenzenesulphonate caused marked damage to the gills in both species, although the cruising speed of L. gibbosus was not markedly affected and the oxygen consumption was altered only slightly. The percentage of deaths of L. gibbosus exposed for 3 months to both 5.6 ppm (the 'biologically safe' concentration) and 18 ppm alkylbenzenesulphonate was greater than in the control fish. It appears, therefore, that the 'biologically safe concentration' equation applies only to acute or short-term exposure, although in the absence of a suitable equation for estimating safe concentrations for chronic exposure it has frequently been used for this purpose too. The results of oxygen consumption tests suggest that chronic exposure to unfavorable environmental conditions involves a series of related events; after the period of damage caused by initial exposure to alkylbenzenesulphonate there is a decline in the ability to function normally, but gradually the fish compensate, at least partially, for this damage by mechanisms not yet understood.

7086. Eberly, W. R. 1962. OXYGEN PRODUCTION IN SOME NORTHERN INDIANA LAKES. Proc. 17th industr. Waste Conf., Purdue Univ. Engng. Extn. Ser. No. 112, pp. 733-747; Water Pollution Abstracts, Vol. 37, No. 5, Abst. No. 725. 1964.

In lakes in northern Indiana, dissolved oxygen is not always uniformly distributed, and there is also considerable variation in the rate of oxygen production, vertical distribution of photosynthesis, and total oxygen production. The author discusses the classification of lakes according to the types of oxygen distribution, factors affecting oxygen concentration, and methods of measuring oxygen production, and then gives results of some studies on oxygen production in Myers, McLish, and Taylor Lakes. Work on this problem is still continuing.

7087. Ford, M. E. 1963. AIR INJECTION FOR CONTROL OF RESERVOIR LIMNOLOGY. J. Amer. Wat. Wks. Assn., 55, pp. 267-274; Water Pollution Abstracts, Vol. 37, No. 5, Abst. No. 726. 1964.

In an attempt to control thermal stratification, with its attendant problems, in Lake Wohlford, an open reservoir of the Escondido Mutual Water Co., Calif., used to supply water for irrigation and domestic purposes, forced circulation of the water by injection of compressed air was begun in the spring of 1962. It was found that injection of air at a rate of about 210 ft^3 per min for 80 hours reduced the differential between the top and bottom temperatures from 16.5° F to 2° F. Mixing of the water eliminated hydrogen sulphide, reduced the chlorine demand of the water, and provided a greater area of aerated water for fish life.

7088. Foxton, P. 1963. AN AUTOMATIC OPENING-CLOSING DEVICE FOR LARGE PLANKTON NETS AND MID-WATER TRAWLS. J. Mar. biol. Ass. U.K., 43, pp. 295-308, 1 plate; Water Pollution Abstracts, Vol. 37, No. 5, Abst. No. 731. 1964.

The author describes an opening and closing device for large nets used for sampling macroplankton. It consists of an inverted Y-tube with a collecting net attached to each limb. A flap inside the tube, controlled by a pressure-release system, separates the two limbs, so that the catch is divided into two parts, one taken above a selected depth, and one below. Technical details with illustrations are given, and the calibration of the trigger mechanism is discussed. Field trials and methods of fishing when used with a 10-ft Isaacs-Kidd mid-water trawl are described. The device has an error of about 14 percent over a range of 0-1000 m.

7089. Hamon, B. V., D. J. Tranter, and A. C. Heron. 1963. A SIMPLE INTEGRATING DEPTH RECORDER. Deep Sea Res., 10, pp. 457-458, 1 plate; Water Pollution Abstracts, Vol. 37, No. 5, Abst. No. 734. 1964.

A simple free-flooding recorder for recording the depth at which sampling gear is operating is described. By means of a radioactive source, it gives a variable-density trace on a fixed photographic film, and from this the maximum and average depths can be read off, as well as the variation about the average. Some results obtained with the instrument in conjunction with a Clark-

Bumpus sampler are illustrated.

7090. Anonymous (Ohio River Valley Water Sanitation Commission Detergent Sub-Committee). 1963. COMPONENTS OF HOUSEHOLD SYNTHETIC DETERGENTS IN WATER AND SEWAGE. J. Amer. Wat. Wks. Ass., 55, pp. 369-402; Water Pollution Abstracts, Vol. 37, No. 5, Abst. No. 801. 1964.

This report of the Orsanco Detergent Sub-Committee reviews information from the literature on the determination of components of synthetic detergents, principally alkylbenzenesulphonates and phosphates, and on their effects in water sewage. The concentrations of alkylbenzenesulphonate found in surface water at present do not interfere with coagulation and sedimentation in water works and do not cause tastes and odors in water. The concentrations found in sewage have no adverse effect on treatment although they may contribute to foaming problems. Laboratory studies suggest that alkylbenzenesulphonate is toxic to fish only in concentrations much higher than those usually found in surface waters. Only part of the phosphate content of surface water is due to phosphates derived from synthetic detergents, and these have not caused difficulty in water treatment, but more work is required to assess the effect of detergent-derived phosphorus on algal growths. A bibliography of 90 references is appended.

7091. Niemitz, W., and W. Pestlin. 1962. THE EFFECT OF BIOLOGICAL SEWAGE TREATMENT ON THE HARMFULNESS OF DETERGENTS TO FISH. Städtehygiene, 13, pp. 231-233; Water Pollution Abstracts, Vol. 37, No. 5, Abst. No. 863. 1964.

Figures are given showing that the toxicity to fish of some new easily decomposable detergent preparations is greater than that of the biologically harder tetrapropylenebenzenesulphonate. Definite toxicity was observed at concentrations of 5-10 mg per liter. Such concentrations are not at present found in effluents from sewage works where 80-90 percent of methylene-blue-active substances are decomposed, but with the increasing use of detergents there is a risk that they might be exceeded. Experiments are described which show that, as with tetrapropylenebenzenesulphonate, fish could withstand much higher concentrations of methylene-blue-active substances in the effluent than in the crude sewage. The possible reasons for this are discussed.

7092. Woodbridge, Hensley C., and Hunter M. Hancock (Murray State College, Kentucky). 1964. A BIBLIOGRAPHY OF THE STRIPED BASS OR ROCKFISH, ROCCUS SAXATILIS (WALBAUM). Avail.: Sport Fishing Institute, Bond Building, Washington, D. C., 23 pp., price $1.00.

This bibliography provides a current and, as nearly as possible, complete reference for use of fishery biologists, outdoor writers, sportsmen, and any others who may find need for information relative to the striped bass. An attempt has been made to list all books, masters theses, doctoral dissertations, state and federal government publications, and technical writings relative to the subject. A majority of the popular articles and many news stories from more readily available newspapers have also been included. Applicability of information to recreational, economic and historical, as well as scientific and technical utilization has been considered throughout.

7093. McNeil, William J., Ralph A. Wells, and David C. Brickell (Bur. Comm. Fish. Biol. Lab., Auke Bay, Alaska). 1964. DISAPPEARANCE OF DEAD PINK SALMON EGGS AND LARVAE FROM SASHIN CREEK, BARANOF ISLAND, ALASKA. U. S. Fish and Wildlife Service Special Scientific Report--Fisheries No. 485, 13 pp.

The abundance of dead 1961 brood year pink salmon eggs and larvae was observed from October 1961 to March 1963 in a small southeastern Alaska stream, Sashin Creek. Dead eggs disappeared slowly from the spawning beds between the end of spawning (October 1961) and the beginning of fry emergence (March 1962). Significant numbers of fragments from dead 1961 brood year pink salmon eggs were found in spawning beds as late as March 1963. Dead 1961 brood year larvae decomposed more rapidly than eggs, disappearing from spawning beds before August 1962.

Dissolved oxygen levels averaging near 50 percent of saturation were observed in Sashin Creek spawning beds when decomposing eggs were present. The evidence did not contradict the hypothesis that decomposing eggs may impair water quality for more than 1 year beyond the date of spawning. (Authors)

7094. Werboff, Jack, and Thomas Lloyd (Wayne State Univ., Detroit, Michigan). 1963. AVOIDANCE CONDITIONING IN THE GUPPY. Phychol. Repts. 12(2): 615-618; Biological Abstracts, Vol. 45, No. 4, Abst. No. 13821. 1964.

Acquisition of a conditioned avoidance response (in a shuttlebox) has been demonstrated in the guppy. Although no reliable differences were observed between the three CS-US intervals used, the trend of the data showing that fewer trials are required to reach criterion with longer CS-US intervals supports similar observations reported for other species of fish. The use of the guppy for studies of behavioral genetics and behavioral teratology has been considered. (B. J. H.)

7095. Blaxter, J. H. S. (Mar. Lab., Aberdeen, Scotland), and F. G. T. Holliday. 1963. THE BEHAVIOR AND PHYSIOLOGY OF HERRING AND OTHER CLUPEIDS. Advan. Mar. Biol. 1. 261-393. Illus. Maps; Biological Abstracts, Vol. 45, No. 4, Abst. No. 13904. 1964.

In distribution and numbers, clupeids are a very successful group of fishes. One reason is their unspecialized nature so that they are able to deal with a wide variety of environmental conditions.

For example, the primitive kidney with its high glomerular count enables them to exploit a wide range of salinities, and the tolerant eggs and larvae can survive in marine, littoral, estuarine and in some cases fresh-water conditions. They are, however, well adapted to a pelagic, shoaling mode of life--mechanically, hydrodynamically, as well as in the biochemical composition and potential activity level of their tissues. Although they depend on a fluctuating food supply, the ability to store fat enables them to survive at all seasons. Presumably, this adaptability has led to the formation of the complex racial system. Clupeids are found in large numbers despite the level of predation to which they are subjected. Presumably the advantages of shoaling far outweigh the disadvantages. Relatively low fecundity does not seem to have been a handicap and this is true where the egg is demersal, as well as where it is pelagic. Nor does a small egg, with little yolk and a small larva dependent on external food soon after hatching, appear to be a disadvantage. The size of a spawning stock seems to have little effect on the subsequent year class strength, so that egg potential does not appear to be in any way limiting. What determines the year class strength, in herring at least, remains a mystery, and yet the fluctuations can be large. Unfortunately, many other aspects of the herring basic biology remain a mystery--in particular its means of migration, the control of its reproductive processes and the interrelationship between different races and the extent to which flow may take place between them. Other problems which have scarcely been touched on are the role of olfactory and auditory stimuli and the function of the complex lateral line in the life of clupeids, and the advantage of the soft body and deciduous scales to their survival. One aspect of specialization is the apparent dominance of vision among the other senses. It seems to be the sense used before all other in feeding, shoaling, spawning and escape. As regards evolutionary position, even the accepted marine species such as the herring have some associations with a fresh-water way of life. This is shown in serological, biochemical and anatomical correspondences with fresh-water fishes, as well as in certain aspects of behavior, such as demersal spawning. It seems most likely that the teleosts originated in fresh water and that the clupeids have retained stronger links with their origins than have other teleosts; perhaps this is due to a much more recent colonization of the sea. (Authors)

7096. Filippova, I. A. 1962. EXPERIMENT ON BREEDING GREAT STURGEON X STERLET HYBRIDS IN COLLECTIVE FISH PONDS OF VORONEZH REGION. (OPYT VYRASHCHIVANIYA GIBRIDA BELUGA X STERLYAD' V KOLKHOZNYKH PRUDAKH VORONEZHSKOI OBLASTI.) Tr. Soveshch. Ikhtiol. Komis. Akad. Nauk SSSR 14. 186-187; Referat. Zhur., Biol., 1963, No. 11I58; Biological Abstracts, Vol. 45, No. 4, Abst. No. 13916. 1964.

In 1954 and 1955 experiments were carried out with hybrids of Huso huso X Acipenser ruthenus, obtained by means of artificial fertilization of brood stock injected with pituitary extract. Intensity of feeding of both fingerlings and yearlings was found to depend on the amount of food in the pond and on the O_2 content of the water. O_2 deficiency lowered the rate of feeding. Basic food consisted of chironomid larvae, the remainder being mainly plankton. For breeding these hybrids it is necessary to use ponds which are not overgrown with vegetation, and which have a small accumulation of mud. Ponds should be 1.2-1.8 m deep for fingerlings and 1.5-2.5 m for yearlings; their shallow zones should be very small.

7097. Ionova, V. A. 1962. A CONTRIBUTION TO THE METHODS OF STUDYING INTRASPECIFIC FOOD RELATIONSHIPS IN THE YOUNG OF CERTAIN CYPRINIDAE. (K METODIKE IZUCHENIYA PISHCHEVYKH VNUTRIVIDOVYKH VZAIMOOTNOSHENII MOLDI NEKOTORYKH KARPOVYKH RYB.) In: Problemy vnutrividovykh otnoshenii organizmov. (Problems of intraspecific relations of organisms.) Tomsk. Univ.: Tomsk. 81-82; Referat. Zhur., Biol., 1963, No. 11I33; Biological Abstracts, Vol. 45, No. 4, Abst. No. 13922. 1964.

In the study of intraspecific food relationships of cyprinid fish, first consideration was given to the determination of daily rations. These were ascertained for juvenile "vobla" (roach), bream, rudd, and white bream of various size groups of fundamentally the same populations at both normal and poor feeding conditions. Daily ration characteristics of food composition were found to be approximately the same in the fish studied. It is thought that, within the limits of a given population, large fish do not harm smaller ones, even when there is an inadequate food base.

7098. Krayukhin, B. V. 1962. EFFECT OF TEMPERATURE AND DIET ON OXYGEN UPTAKE RATE IN CARP. (VPLYV TEMPERATURY I ZHYVLENNYA NA INTENSYVNIST' SPOZHYVANNYA KISNYU KOROPOM.) In: Deyaki pytannya fiziolohii travlennya ta obminu rechovyn u ryb. (Problems of the physiology of digestion and metabolism in fish.) Akad. Nauk Ukrain. RSR: Kiev. 25-39. 1962; Referat. Zhur., Biol., 1962, No. 1I69; Biological Abstracts, Vol. 45, No. 4, Abst. No. 13928. 1964.

Experiments were conducted on fingerlings weighing 10-15 g (small) and 20-30 g (large) in 20-liter aquarium tanks at the following temperatures: 20-18°, 7-5°, 5-4°, 4-3°, 2-1° C. For low temperature experiments the tanks were placed in a freezing cabinet into which light was admitted during daytime. Fish fasted 3 days prior to experimentation. In fingerlings fed rapeseed oil cake at 20-18° C, the uptake rate of dissolved oxygen was found to be 2.58-2.67 times as great as that observed in the controls; at 7-5°, 5-4°, and 4-3° C it was, respectively, 1.43-1.48, 1.25-1.27, and 1.05-1.12 times as great. Correspondingly, the dissolved oxygen uptake rate in fingerlings fed sewage worms was shown to be 2.16-2.26, 1.37-1.38, 1.13-1.17,

and 1.05-1.06 times as great as in the controls. With respect to their influence on oxygen uptake rate, the foods can be arranged, in decreasing order of effectiveness, as follows: rapeseed oil cake, flour, chironomid larva, sewage worms. In the range of 2-1° C, controls did not differ from experimental animals in oxygen utilization; the fish did not eat. Energy output (according to O_2 consumption) associated with feeding at 20-18° C constituted, in each case, half the total energy output; at 7-5°, 5-4°, and 4-3° C, respectively, it constituted 1/4, 1/7-1/5, and 1/25-1/7 the total energy output.

7099. Levanidov, V. Ya., and I. M. Levanidova. 1962. BREEDING-AND-REARING WATERS OF THE TEPLOVKA FISH FARM AND THEIR BIOLOGICAL PRODUCTIVITY. (NERESTOVO-VYRASTNYE VODOEMY TEPLOVKAO RYBOVODNOGO ZAVODA I IKH BIOLOGICHESKAYA PRODUKTIVNOST'.) Izvest. Tikhookeansk. Nauch.-Issled. Inst. Rybn. Khoz. i Okeanog. 48. 3-66; Referat. Zhur., Biol., 1963, No. 11I57; Biological Abstracts, Vol. 45, No. 4, Abst. No. 13932. 1964.

This paper is concerned with hydrochemical and hydrological regimes of rearing waters, seasonal changes in the biomass of benthos, biology of numerous forms of chironomids, utilization of food resources by juvenile chum (Oncorhynchus keta), and productivity of rearing ponds. It is noted that food resources had been underexploited. It is recommended that spawners be permitted to enter Lake Teplovka where natural spawning can occur; this will ensure the hatching of salmon young at an earlier time and will promote utilization of larvae and pupae of Syndiamesa orientalis, which are not used by pond-raised chum. Conditions of the food supply can be ameliorated by destruction of chum competitors and trash fish (stickleback, grayling, minnow, and Brachymystax lenok), as well as by restoration of the border of bushes along the banks. Bibliography includes 25 titles.

7100. Matisone, M. N. 1962. INCREASING THE FISH PRODUCTION OF MARSH PONDS IN THE LATVIAN SSR BY A COMBINATION OF FERTILIZERS. (POVYSHENIE RYBOPRODUKTIVNOSTI PRUDOV BOLOTNOGO PITANIYA V LATVIISKOI SSR PUTEM KOMPLEKSNOGO UDOBRENIYA.) Tr. Soveshch. Ikhtiol. Komis. Akad. Nauk SSSR 14. 37-40; Referat. Zhur., Biol., 1963, No. 11I70; Biological Abstracts, Vol. 45, No. 4, Abst. No. 13936. 1964.

The work was done primarily in rain-fed ponds up to 1 m deep. Mineral fertilizers (lime, 125-1200 kg per hectare; superphosphate, 165-1200 kg/ha, and others) were used. Of organic fertilizers, manure, from 1000 to 5150, and vegetable fertilizers, from 150 to 2760 kg/ha, were used. Application of mineral fertilizers improved salinity of the water and promoted photosynthesis. Application of organic fertilizers enhanced the development of zoobenthos and zooplankton. Application of maximum doses of complex fertilizers raised the fish productivity of the ponds to 650-780 kg/ha; with low doses, the crop amounted to 390 kg/ha. During the growing period, fertilizers were applied 1-2 times a month.

7101. Mukhina, R. I. 1958. THE QUALITY OF CARP FINGERLINGS RAISED IN FERTILIZED PONDS WITH ARTIFICIAL FOOD. (KACHESTVO SEGOLETKOV KARPA, VYRASHCHENNYKH V UDOBRENNYKH PRUDAKH S PRIMENENIEM KORMLENIYA.) Tr. Vserossisk. Nauchn.-Issled. Inst. Prudovogo Rybn. Khoz. 9. 85-97; Referat. Zhur., Biol., 1959, No. 30469; Biological Abstracts, Vol. 45, No. 4, Abst. No. 13940. 1964.

The combined application of pond fertilization and the feeding of fish greatly improved the physiological state of carp fingerlings, increasing the number of hibernating yearlings up to 70%. The fingerlings raised in ponds fertilized with aquatic vegetation and superphosphate had the greatest values for average weight (28.77 g), fat (6.42%), mineral substances (2.14%), protein (13.31%), and highest degree of caloricity (29.21 kcal). The chemical composition of the body depends mainly on the food. Food poor in mineral substances affects the metabolism of minerals and the young fry die during hibernation. The highest blood hemoglobin content (51%) was noticed in fingerlings from the control ponds and from ponds fertilized with vegetable meal and superphosphate (48%). In order to increase the quality of fingerlings it is necessary to increase the dry content to 25-30%, and to decrease the water content to 70 to 72%. (Courtesy NSF (PL 83-480) 1963.)

7102. Pomazovskaya, I. V. 1962. ON THE RATE OF DIGESTION IN PERCH AND RUFFE. (O SKOROSTI PEREVARIVANIYA PISHCHI OKUNEM I ERSHOM.) In: Gidrobiologicheskie issledovaniya. (Hydrobiological studies.) Tartu. 3: 201-205; Referat. Zhur., Biol., 1963, No. 11I51; Biological Abstracts, Vol. 45, No. 4, Abst. No. 13949. 1964.

Observations were made at Syamozero (Karelian ASSR) in August-October 1958. After the fish were caught, some of them were fixed and the rest were placed in aquaria. A sample (10-30 fish) was taken every 2 hours. It was found that perch young feed more intensively during morning and evening hours, while those of ruffe feed more intensively during evening hours. The feeding of perch young was more extensive in August than in October. Rate of digestion depends upon water temperature. At 11° C almost half of the stomach contents are digested during the first 4-5 hours, and after that digestion slows down. Complete elimination of waste materials from the stomach occurs in 12-24 hours, and from the intestines in 30 hours. In adult perch, digestion is completed in 50 hours (at a water temperature of 3.5-5° C). In ruffe, at a water temperature of 8.5-11° C, digestion continues for 15-19 hours.

7103. Ponedelko, B. I. 1963. THE SURVIVABILITY

OF DIFFERENT-AGED YOUNG OF THE PELED COREGONUS PELED (GMELIN) UNDER VARIOUS ECOLOGICAL CONDITIONS. (VYZHIVAEMOST' RAZNOVOZRASTNOI MOLODI PELYADI COREGONUS PELED (GM) V RAZLICHNOI EKOLOGICHESKOI OBSTANOVKE.) Vopr. Ikhtiol. 3(1): 113-123; Biological Abstracts, Vol. 45, No. 4, Abst. No. 13950. 1964.

In 1959-60 experiments were carried out in basins, ponds, and isolated areas in lakes of the Northwest, in order to assay the developmental changes in size of peled larvae and underyearlings and to determine at what sizes peled young were no longer suitable as prey for the more common of the native predaceous fishes. Larvae were maintained in basins, etc., into which were placed various predaceous and so-called "peaceful" fishes. In fenced-off lake sectors, predation counts were performed by extensive sampling, stomach analyses and poisoning of the water in November. Peled larvae were preyed upon most readily, a chief cause of which was a lack of suitable cover. The survival rates of the larger fingerlings was primarily dependent upon their size when introduced and the density and sizes of the predaceous fish population (Perca fluviatilis, then Stizostedion sp.). Tests conducted in basins and ponds indicated the existence of a limiting or "threshold" prey size, above which a given peled was no longer preyed upon by a predator of known size and species. This "threshold" size is a function of the size of the predator fish and may be expressed as the coefficient of the relative threshold prey size, equal to: $\frac{\text{size of prey}}{\text{size of predator.}}$ The relative threshold prey size coefficients for peleds were: Perca fluviatilis, 0.7, roach Rutilus rutilus, 0.4, and carp, Cyprinus carpio, 0.3. Thus, knowing the size distributions of the common fishes preying on peleds in a particular body of water, and knowing the relative threshold prey size coefficients, "safe" underyearling sizes (above which appreciable predation should not occur) may be computed for effective peled stocking. (L. T. P.)

7104. Shkorbatov, G. L. 1962. ON INTRASPECIFIC FUNCTIONAL VARIABILITY IN AQUATIC ANIMALS. (O VNUTRIVIDOVOI FUNKTSIONAL'NOI IZMENCHIVOSTI U VODNYKH ZHIVOTNYKH.) In: Problemy vnutrividovykh otnoshenii organizmov. (Problems of intraspecific relations of organisms.) Tomsk. Univ.: Tomsk. 99-101; Referat. Zhur., Biol., 1962, No. 11I3; Biological Abstracts, Vol. 45, No. 4, Abst. No. 13960. 1964.

Biochemical characteristics of fish from northern populations were compared with those of fish from southern populations. The fat iodine number of roach and bream diminishes from north to south, and the enzymatic activity of liver dehydrase is greater in northern than in the southern carp. Variations in the period of thermal catalase inactivation in Lake Chud whitefish (Coregonus lavaretus maraenoides) are recorded. In an isolated population, functional intraspecific variability may lead to formation of new species.

7105. Spanovskaya, V. D., V. A. Grigorash, and T. N. Lyagina (Dept. Ichthyol., Moscow State Univ., Moscow, USSR). 1963. THE DYNAMICS OF FISH FECUNDITY AS EXEMPLIFIED BY THE ROACH RUTILUS RUTILUS (L.). (DINAMIKA PLODOVITOSTI RYB NA PRIMERE PLOTVY RUTILUS RUTILUS (L.).) Vopr. Ikhtiol. 3(1): 66-83; Biological Abstracts, Vol. 45, No. 4, Abst. No. 13961. 1964.

Materials on the eggs production (P) of different races of roaches were collected in the Uchinsk and Mozhaisk Reservoirs (1958-61) and were taken from the literature. Absolute productivity (AP) was computed for age rather than for size or weight. The relative productivity (RP) (number of eggs per gram) was computed for fish weight with or without viscera. The population productivity (PP) was computed according to the formula:

$$PP = \frac{\text{average P of 100 females}}{\text{average age of 100 females}}$$

The magnitude of P for the different subspecies assayed was correlated with the rate of growth. The AP and OP of fast-growing subspecies (R. rutilus caspicus and R. rutilus heckeli) are greater than the AP and OP of slow-growing subspecies (R. rutilus fluviatilis and river populations of R. rutilus). In a dwarf form, R. rutilus uzboicus, the AP is also lower, but the OP is relatively high. The OP reflects the overall reproductive capacity and varies with environmental conditions. While rapid-growing roach subspecies reach sexual maturity at earlier ages, they die younger and thus produce a lesser overall number of eggs. P is a species attribute that varies (adaptively) in accordance with environmental demands. The number of eggs produced in a given year by uniform sized individuals is dependent upon the rate of growth preceding the onset of breeding "readiness," while the rate of growth subsequently is manifested in an increase in the weight of the egg's nutrient supply. (L. T. P.)

7106. Watson, D. G. 1961. SALMON SPAWNING IN THE VICINITY OF HAPO (HANFORD ATOMIC PRODUCTS OPERATION) - 1960. U. S. Atomic Energy Comm. Res. and Develop. Rept. HW-69500. 156-158; Biological Abstracts, Vol. 45, No. 4, Abst. No. 13971. 1964.

The salmon nest counts for 1960 were appoximately the same as those for 1959. Fluctuations in the local population are compared with the yearly salmon counts at Bonneville and McNary Dams. Rapid change in river level due to dams upstream from HAPO left some salmon nests completely out of water. (Auth.)

7107. Zusser, S. G. 1958. CAUSES OF DAILY VERTICAL FISH MIGRATION. (K IZUCHENIYU PRICHIN SUTOCHNYKH VERTIKAL'NYKH MIGRATSII RYB.) Tr. Soveshch. Ikhtiol. Komis. Akad. Nauk SSSR 8. 115-120; Referat. Zhur., Biol., 1959, No. 53894; Biological Abstracts, Vol. 45, No. 4, Abst. No. 13974. 1964.

The daily vertical migration of fish depends on the migration of the plankton on which the pelagic fish feed. The hypotheses of causes of daily vertical

plankton migrations are examined. (Courtesy NSF (PL 83-480) 1963.)

7108. Houston, A. H., and N. W. Falkner (Dept. Zool., Univ. Manitoba, Winnipeg, Manitoba, Canada). 1963. A NOTE ON THE RAPID SEPARATION OF GOLDFISH HEMOGLOBINS BY PAPER ELECTROPHORESIS. Rev. Canadienne Biol. 22(1): 123-126; Biological Abstracts, Vol. 45, No. 4, Abst. No. 14007. 1964.

Several paper-buffer combinations have been tested in an attempt to develop a rapid and reliable procedure for the routine separation of goldfish hemoglobin polymorphs by paper electrophoresis. Best results were obtained with Whatman ecteola cellulose and tris-EDTA buffer run for 4 hr. at 20 mA. (Authors)

7109. MacLeod, Robert A. (Macdonald Coll., St. Anne de Bellevue, Quebec, Canada), R. E. E. Jonas, and E. Roberts. 1963. GLYCOLYTIC ENZYMES IN THE TISSUES OF A SALMONOID FISH (SALMO GAIRDNERI GAIRDNERI). Canadian Jour. Biochem. and Physiol. 41(9): 1971-1981; Biological Abstracts, Vol. 45, No. 4, Abst. No. 14228. 1964.

Glycolysis in various tissues of the steelhead trout (Salmo gairdneri gairdneri) has been studied in vitro using tissue extracts and homogenates. Of the tissues examined, skeletal muscle, heart muscle, liver and kidney, only heart muscle homogenate was found to be capable of converting free glucose to lactic acid without added hexokinase. Low hexokinase activity or low hexokinase activity coupled with adenosine triphosphatase activity accounted for the failure of the other tissue homogenates to attack glucose. Qualitative and quantitative studies have indicated the presence of hexokinase, phosphoglucoisomerase, phosphofructokinase, aldolase, glyceraldehyde-3-phosphate dehydrogenase, phosphoglyceromutase, enolase, pyruvic kinase, and lactic dehydrogenase in the various fish tissues examined. Except for hexokinase and phosphofructokinase, the activities of the glycolytic enzymes of skeletal muscle were found to be 10 to 100 times greater than those of the same enzymes in the other tissues tested. Diphosphopyridine nucleotide (DPN) and adenosine diphosphopyridine (ADP) were cofactors and iodoacetate and fluoride plus phosphate inhibitors of enzymes of the fish glycolytic systems. It can be concluded from this study that the Embden-Meyerhof glycolytic pathway functions in tissues of the anadromous salmonoid S. gairdneri gairdneri. (Authors)

7110. Fromm, Paul O. (Dept. Physiol. and Pharmacol., Michigan State Univ., East Lansing). 1963. STUDIES ON RENAL AND EXTRA-RENAL EXCRETION IN A FRESH-WATER TELEOST, SALMO GAIRDNERI. Comp. Biochem. and Physiol. 10(2): 121-128; Biological Abstracts, Vol. 45, No. 4, Abst. No. 14993. 1964.

The total waste nitrogen excreted by rainbow trout at 12-14° C declined rapidly during the first 6 days of starvation. It was less variable during the sixth to fourteenth day of starvation and averaged 136 mg N/kg per day. Only about 3 percent of the total waste nitrogen was excreted via the kidney. The amount of ammonia-N excreted amounted to about 60 percent of the total nitrogen excreted and followed a similar excretion pattern with starvation. Values for osmotic concentration and daily urine volume are given along with values for concentration of some inorganic ions in both blood and urine. From these data renal clearances for these ions were calculated along with urine plasma concentration ratios. (Auth.)

7111. Pequignot, J., and A. Serfaty (Lab. Biol. Animal Fac. Sci., Toulouse, France). 1963. TISSUE RESPIRATION IN THE GILLS OF FRESH-WATER TELEOST FISHES. (LA RESPIRATION TISSULAIRE DES BRANCHIES DES TÉLÉOSTÉENS D'EAU DOUCE.) Hydrobiologia 22(1/2): 47-54; Biological Abstracts, Vol. 45, No. 4, Abst. No. 15018. 1964.

The respiratory metabolism of pieces of gill filaments of tench (Tinca tinca) and barbel (Barbus fluviatilis) was measured in Warburg apparatus. Experiments were carried out at different times of the year and higher respiration rates were recorded in spring than in winter. A slightly higher rate was observed in barbel gills than in tench gills. (K. E. M.)

7112. Botticelli, Charles R., Frederick L. Hisaw, Jr., and W. D. Roth (Biol. Lab., Harvard Univ., Cambridge, Massachusetts). 1963. ESTRADIOL-17β, ESTRONE, AND PROGESTERONE IN THE OVARIES OF LAMPREY (PETROMYZON MARINUS). Proc. Soc. Exptl. Biol. and Med. 114(1): 255-257; Biological Abstracts, Vol. 45, No. 4, Abst. No. 15044. 1964.

Ovaries of cyclostomes (Petromyzon marinus) were examined for sex steroids. The ripe ovaries contain a minimum of 16μg estradiol-17β/kilo of fresh ovarian tissue determined by the Astwood 6 hour assay. The biologically active material was identified as estradiol-17β and estrone by countercurrent distribution, paper chromatography and bioassay. Presence of progesterone was tentatively identified by methods of column chromatography and Hooker-Forbes assay. (Authors)

7113. Nicol, J. A. C. (Mar. Biol. Assoc., Plymouth, England). 1963. SOME ASPECTS OF PHOTORECEPTION AND VISION IN FISHES. Advan. Mar. Biol. 1: 171-208; Biological Abstracts, Vol. 45, No. 4, Abst. No. 15263. 1964.

Light-sensitive areas of cyclostomes are the skin, spinal cord, brain, pineal complex, and paired eyes when present. The hag is practically eyeless and has integumentary photoreceptors at the anterior end of the head and in the cloacal region. The caudal region of the ammocoetes is especially sensitive to light; photoreceptors additional to the pineal complex and the paired eyes occur in the head of the lamprey. Integumentary photoreceptors occur in blind cavefishes and may be present in some

marine fishes. The pineal region of many teleosts is sensitive to light and mediates some behavioral and color responses. Chromatophores over the pineal region control the amount of light reaching the pineal complex. Pupillary movement takes place in some benthic selachians and teleosts. An occlusible tapetum lucidum lies in the chorioidea of pelagic elasmobranchs and movement of pigment across the tapetum, in light or darkness, takes place slowly. Retinomotor changes--radial excursions of receptors and retinal pigment--in teleosts also occur slowly, in 30 to 60 min, and are related to changes in light intensity. Threshold values of several species have been determined. A slight degree of hypermetropia is postulated from retinoscopy of selachian and teleost eyes, the significance of which awaits explanation. The aplanatic condition and very short focal length of the teleost lens are thought to be the result of its having a changing refractive index from the center to the periphery. When accommodating, the lens is displaced backwards along the antero-posterior axis and brings distant objects into focus on the posterior retina. Rhodopsins, based on vitamin A_1 aldehyde, are characteristic of marine fishes. They have a great range of absorption maxima, ranging from maxima around 480 mμ (visual golds or chrysopsins of deep-sea species) to purple rhodopsins with maxima around 510 mμ in fishes of turbid coastal waters. The absorption characteristics of these various scotopic visual pigments seem to be related to the quality of light in the environment-residual blue daylight or luminescence in clear oceanic waters, filtered blue-green or green light in inshore waters. The eel, when metamorphosing, changes purple rhodopsin for chrysopsin. Lenses of diurnal and surface dwelling fishes, that encounter ultraviolet light, absorb short wavelengths, whereas those of nocturnal and of deep-water fishes are usually transparent to ultra-violet. Despite great interest in photo-responses of fishes, estimates of visual thresholds are derived largely from observations on man and other animals. Fish may be able to just detect daylight having a flux of 10^{-8} $\mu W/cm^2$; for a small, steady light-source the threshold may be still lower. Various factors increasing the efficiency of the eye of fishes may improve these estimates by several degrees of magnitude. Measurements of oxygen tensions in the vitreous humor indicate that the chorioidal gland of the teleost eye is a rete mirabile, concerned with supplying oxygen to the retina. Recent ethological and ecological studies concerned with photic stimuli have dealt with color changes, schooling, migratory movements of katadromous salmon and trout, diurnal vertical migrations, responses to intermittent light, colored lights and strong steady lights, and the operation of sun-compass reactions in horizontal migrations. 143 references. (Auth.)

7114. Bennett, M. V. L., E. Aljure, Y. Nakajima, and G. D. Pappas (Columbia Univ., Coll. Physicians and Surg., New York, N. Y.). 1963. ELECTROTONIC JUNCTIONS BETWEEN TELEOST SPINAL NEURONS: ELECTROPHYSIOLOGY AND ULTRASTRUCTURE. Science 141(3577): 262-264; Biological Abstracts, Vol. 45, No. 4, Abst. No. 15299. 1964.

Electrotonic transmission between spinal neurons is correlated with distinctive apposition of cell processes involving membrane fusion. In the same neurons, postsynaptic potentials appear to arise at typical synaptic knobs where there is an intercellular space. (Authors)

7115. Furukawa, T., Y. Fukami, and Y. Asada (Osaka City Univ. Med. Sch., Osaka, Japan). 1963. A THIRD TYPE OF INHIBITION IN THE MAUTHNER CELL OF GOLDFISH. Jour. Neurophysiol. 26(5): 759-774; Biological Abstracts, Vol. 45, No. 4, Abst. No. 15312. 1964.

Analysis of collateral inhibition in the Mauthner cell disclosed that there existed, in addition to the two previously described, a different type of inhibition whose action, as estimated by a reduction of the EPSP size, was not correlated with an increase of the membrane conductance of the cell. Clear evidence for this was obtained with the help of procaine which, when injected into the animal, blocked the post-synaptic inhibition acting on the soma of the Mauthner cell without influencing the new and different type of inhibition. Additional evidence obtained by recording potentials from the afferent fibers, as well as from the dendrite of the Mauthner cell seem to indicate that the inhibitory action concerned is exerted on both the presynaptic elements and the dendrite of this cell. (Authors)

7116. Kholodov, Y. A. (Inst. Higher Nerv. Activity, Moscow, USSR). 1960. SIMPLE AND COMPLEX FOOD-OBTAINING CONDITIONAL REFLEXES IN NORMAL FISH AND IN FISH AFTER REMOVAL OF THE FOREBRAIN. (PROSTYE I SLOZHNYE PISHCHEDOBYVATELNYE USLOVNYYE REFLEKSY U RYB V NORME I POSLE UDALENIYA PEREDNEGO MOZGA.) Works Inst. Higher Nerv. Activity Acad. Sci. USSR Physiol. Ser. 5: 194-201; Biological Abstracts, Vol. 45, No. 4, Abst. No. 15381. 1964.

Simple reflexes were elaborated in normal fish and fish from which cerebral hemispheres had been removed. Coupled to simple reflexes, a chain reflex and a conditional inhibitor to it were also instituted. The effect of Chlorpromazine on these was also studied. Removal of forebrain neither eliminated food-obtaining conditional reflexes nor affected the elaboration of positive differentiation. Chlorpromazine, however, decreased conditional reflexes in fish without cerebral hemispheres. Unlike higher vertebrates, fish forebrain appeared to have no part in the formation of simple and complex conditional reflexes. (B. S. S. R. R.)

7117. Buznikov, G. A. 1958. THE PHYSIOLOGY OF THE HATCHING OF BONY FISH LARVAE. (MATERIALY PO FIZIOLOGII VYLUPLENIYA EMBRIONOV KOSTISTYKH RYB.) Tr. Soveshch. Ikhtiol. Komis. Akad. Nauk SSSR 8. 421-426; Referat. Zhur., Biol., 1960, No. 4808; Biological Abstracts, Vol. 45, No. 4, Abst. No. 15955. 1964.

The deterioration of aeration in the environment

caused the premature hatching of bony fish. However, an improvement in oxygenation and factors promoting its improvement (incubation in running water, and the prior action of a solution of hatching enzyme on the egg membranes) halted hatching. Removal of the egg membranes also stoped secretion by the hatching glands. The stoppage could be eliminated by reducing the oxygen. (Courtesy NSF (PL 83-480) 1963.)

7118. Nechiporenko, Yu. D. 1963. LEVOMYCETIN AND BIOMYCIN IN INFECTIOUS DROPSY OF CARP. (LEVOMITSETIN I BIOMITSIN PRI KRASNUKHE KARPOV.) Veterinariya 40(7): 46; Biological Abstracts, Vol. 45, No. 4, Abst. No. 16663. 1964.

The prophylactic and therapeutic effect of these antibiotics was successfully tried in experimental carp. The medication was administered intestinally by urethral catheter to infected fish one or more times. A dose of 50 mg/kg levomycetin introduced 5 times resulted in 100% recovery. For prophylaxis, the medication was added to feed which would not disintegrate in water (spaghetti, for example); at present, eulevomycetin is used which is insoluble in water. The authors describe in detail the preparation of fish food containing the medication, the doses and their seasonal variation. (E. E.)

7119. Whitehead, P. J. P. (Brit. Mus. Nat. Hist., London, England). 1962. A CONTRIBUTION TO THE CLASSIFICATION OF CLUPEOID FISHES. Ann. and Mag. Nat. Hist. 5(60): 737-750; Biological Abstracts, Vol. 45, No. 4, Abst. No. 17707. 1964.

The herring (Clupeidae), the gizzard shad (Dorosomatidae), the round herring (Dussumieriidae), and the anchovies (Engraulidae) have been united in a suborder, Clupeoidei, of the rather diverse and perhaps artificial order Clupeiformes. A number of different schemes exist for dividing the Clupeiformes into divisions, suborders, and superfamilies. The present contribution serves mainly to unite more firmly the members of the Clupeoidei, and at the same time shows that the Chirocentridae should also be placed in this suborder. Two new characters are described here, posterior frontal fontanelles and pelvic scutes. "Although neither character can be considered in any way fundamental in the evolution of the clupeoid fishes, their retention and development in some groups, and their absence in others, is perhaps indicative of certain phylogenetic relationships." After discussing these characters for various groups, a synopsis is given for the suborders Elopoidei and Clupeoidei, with diagnoses of superfamilies and families in each. (A. K. W.)

7120. Atz, James W. (New York Aquarium, New York Zoological Society, Brooklyn). 1964. A WORKING BIBLIOGRAPHY ON REARING LARVAL MARINE FISHES IN THE LABORATORY. Sea-Water Systems for Experimental Aquariums, U. S. Fish and Wildlife Service Research Report 63, pp. 95-102.

The literature available on bibliographic resources on rearing larval marine fishes in laboratory aquariums is reviewed critically; the list of reference papers of special interest are designated. A list of marine teleost fishes reared in captivity is included. (Auth. Abst.)

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